



British Guiana.

DIVISIONAL REPORTS

OF THE

DEPARTMENT OF AGRICULTURE,

FOR THE YEAR

1934.

GEORGETOWN, DEMERARA:
PRINTERS TO THE GOVERNMENT OF BRITISH GUIANA.
"THE ARGOSY" COMPANY, LIMITED.

1935.

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Assistant Agricultural Superintendents	...	{ A. A. Abraham. E. G. A. Benson, B.Sc. (Lond.) Dip. Agr. (Wye), A.I.C.T.A.
Agricultural Instructors	...	{ E. M. Morgan. C. C. Dowding, F.L.S., F.R.H.S. L. E. McKinnon. A. W. Sears. W. A. Bovell.
Agricultural Assistants	...	{ J. Indrobeharry. H. B. France.
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Supernumerary Entomologist	...	...F. A. Squire, B.Sc. (S.A.), A.I.C.T.A., F.R.E.S.
Botanist and Mycologist	...	...E. B. Martyn, B.A. (Oxon et Cantab.), A.I.C.T.A.
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Assistant Chemist	...	...C. L. C. Bourne.
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Experiment Station (Rice), Georgetown— (Plant Breeder)	...	...L. E. W. Codd, M.Sc. (S.A.), A.I.C.T.A.
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		SUGAR EXPERIMENT STATIONS.
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Laboratory Assistants	...	...L. A. Robinson (seconded), H. B. Singh.
Field Assistants	...	...L. A. Forte, St. G. Cooper, Dip. Agr., B. A. McArthur.
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(In collaboration with the officers of the Department of Agriculture).		
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Registrar, Assistant	...	...E. S. Douglas.
The District Agricultural Officers are Chairmen of the several banks.		



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DEPARTMENT OF AGRICULTURE.

REPORT OF THE BERBICE DIVISION FOR THE YEAR 1934.

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REPORT OF THE BERBICE DIVISION FOR THE YEAR 1934.

GENERAL.

Although such serious floods as occurred in January on other parts of the coast were not experienced in Berbice, yet the abnormally heavy rainfall at the end of 1933 and early in 1934 caused considerable damage and these ill-effects were magnified by the dry weather in the later part of the year. Flood relief work, consisting of the distribution of seed padi and ground provision planting material was engaged in, and continued up to July of this year. Flood relief competitions—to encourage farmers to re-establish their cultivations and to repair the flood damage—were initiated on the West Coast and the West Bank, Berbice, and on the Corentyne Coast but owing to the subsequent drought experienced, three of these competitions could not take place.

CROP CONDITIONS.

Sugar.

2. The total acreage under cultivation was 22,632 English acres whilst the total acreage reaped including farmers' canes, was 21,663 English acres yielding 60,675 tons of which 59,849 tons were produced on sugar estates. The sugar estates in the district suffered considerable losses owing to the abnormal weather conditions prevailing. It is gratifying to note the keen interest taken by the sugar estates in the newer varieties. One estate boasts of 500 odd acres of P.O.J.2878 while another has both P.O.J.2878 and Diamond 10 on almost every section. It will not be long before the capabilities of each cane for certain particular soils will be recognised. The value of up-to-date scientific instruments has also been recognised and on one estate a regular programme of tests for maturity in the growing canes is carried out. On practically every estate in Berbice there is a laboratory, manned by a competent staff, dealing with the extension of the cane moth borer parasite. This work is proving very effective as all estates report the collection of second generation parasitism.

Rice.

3. Only one crop per annum (autumn crop) is grown in the District. The acreage reaped in 1934 was 24,990 English acres yielding 239,441 bags of padi. Great interest was taken in the rice crop this year because of the difficulties in which the farmers found themselves subsequent to the loss, by floods, of the autumn crop of 1933. All available areas were taken up and the increased demand for pure seed padi was noticeable. The Department's entire stock of seed was sold or loaned about three months before the crop was due. Those farmers who took advantage of the early rains to sow their crops had a certain amount of success, but in some areas planting was taking place in September. In the more lucky areas the seed in the nurseries, or the seed "shied" on the land, germinated well and looked promising. In certain unirrigated areas transplanting even took place; but the drought then set in and on areas dependent solely on rainfall the loss was complete. The sugar estates, however, by a generous supply of irrigation water, enabled some areas to be cultivated. On the Corentyne Coast, according to the agricultural census returns, between Lancaster and Hogstye, 1,010 acres gave not a single bag of padi and in the area between No. 45 and No. 50 villages 375 acres gave only 60 bags of padi. The average over the whole district is 10.6 bags per acre. The position is serious and great doubt is felt regarding the supply of seed to farmers in these areas for the 1935 autumn crop.

Coconuts.

4. The area under cultivation was 3,205 English acres from which 741,000 nuts were obtained. The rearing of pigs has increased the demand for coconut meal in

the district. Some interest has been aroused in this crop owing to the local manufacture of Fryol. Farmers are planting from selected nuts and an increased care is shown towards diseased trees.

Cocoa.

5. Work in conjunction with the river estate proprietors has been begun in an attempt to discover any varieties of cacao immune from Witchbroom disease. Periodical visits have been paid to trees apparently immune and their progress will be watched.

Ground Provisions.

6. There has been a great increase in the cultivation of ground provisions since the floods. This was beneficial since the importations of provisions into the district previously were very large.

DISTRICT WORK.

Sugar.

7. The trials laid down in the district during the year are fully detailed in the report of the Cane Agronomist published elsewhere. The estates at which trials were laid down were Port Mourant, Rose Hall, Blairmont, Providence and Albion.

Rice.

8. *Pure Line Seed Padi*.—A fifteen-acre block of No. 79 padi was grown at Pln. Port Mourant which, on winnowing and bagging off, gave a yield of 31 bags (143 lb. each) per acre, totalling 420 bags. A sample of this was examined in Georgetown and found to be of a high standard of purity. Pure line No. 79 seed will be used for distribution to farmers throughout the district during 1935 when it is hoped to put down pure line nursery plots to the extent of 1,600 acres extending from Crabwood Creek to Abary Creek.

9. A pure line seed padi nursery scheme has been arranged which allows for sufficient seed being supplied to farmers to plant the entire rice area grown by each in 1936. Contracts will be made with each rice farmer by which he will guarantee to reserve for the 1936 crop pure line seed sufficient for his need. As an example:—A farmer cultivating 100 acres of rice land, on notifying his intention of entering the scheme, will be supplied with a half bag of pure line seed padi with which he will establish a nursery of two acres. He should obtain 40–60 bags of padi, from which, even under the most adverse storage conditions, he will be able to reserve 25 bags, or sufficient seed to plant his entire area in 1936. In certain areas pure line seed farms will be established—it is hoped in each section or village—from which seed will be available to farmers in that particular area.

10. *New Pure Seed Padi Block*.—With the co-operation of the Whim Village Council an area of land has been taken in at the south end of the Whim demonstration plot for the purpose of growing pure line seed padi for distribution. Seed for this area is sent from the Central Station, Georgetown, and the resultant seed is distributed to the pure line seed nurseries mentioned above. In this way the stock of padi in Berbice should show a steady improvement in quality.

11. *Pure Line Seed Distribution*:—In addition to the distributions from Flood Relief Funds, referred to elsewhere, the following quantities of pure seed were distributed, either free or under the "loan scheme."

Demerara Creole	...	...	6½ bags
No. 79 ...	...	...	198½ bags
Total			<u>205 bags</u>

12. *Rice Grading.*—The following table gives details of all rice graded and exported from New Amsterdam and Springlands during the year.

NEW AMSTERDAM.

Destination.	No. 1.	No. 2.	No. 3.	Broken.	Total.
Barbados	163	460	...	...	623
Trinidad	...	459	1,350	...	1,800
St. Kitts	...	...	50	...	50
Jamaica	...	...	1,800	...	1,800
New York	200	...	...	...	200
	363	910	3,200	...	4,473

SPRINGLANDS.

Gadeloupe	...	300	11,650	...	11,950
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New rice grading regulations came into force in October and exporters and others have been educated, to some extent, in their meaning and significance.

School Gardens.

13. The Auchlyne school garden has suffered from the same difficulties as experienced at the Whim demonstration plot which it adjoins. Nevertheless, the work has progressed favourably and the assistant teacher, who attends with the boys during their school garden period, namely on Tuesday and Thursday mornings, is deserving of praise for his regularity, interest, and encouragement to the pupils. It is unfortunate that the garden is some distance from the school which makes the time spent in actual work very short. The Agricultural Instructor or the Agricultural Superintendent is present during most of the sessions and practical demonstrations are given.

14. The Edinburgh school garden is in the grounds of, and is carried on by the school children attending Edinburgh Scots School, East Bank, Berbice. During the year an extension was made to the garden, a plot of about 8 square rods being taken in on the western side of the plot. The attendance of the pupils was regular. There were on the average 12 boys at each session. The Agricultural Assistant attended twice a week, *viz.*, on Tuesday and Thursday mornings, to give instructions to the boys and to encourage them in their work. The garden is well fenced and laid out. The beds are all four feet in width with one foot drains between. This allows sufficient soil to raise the beds and improve the drainage, and sufficient space for the boys to work comfortably between the beds.

15. Three school gardens are carried on without financial help from Government and the Head Teachers are to be complimented on the success achieved under the difficulties encountered. The Superintendent and his Officers have paid periodical visits to these gardens throughout the year but little real work can be done without proper tools, proper fencing, drainage and a supply of irrigation water. Gardens exist at Sandvoort, West Canje, Berbice High School, New Amsterdam and Cumberland, East Canje, and it is gratifying to note that, in the school gardens competition held this year, individual prizes were obtained by boys in these schools.

Competitions.

16. The following competitions took place in the Berbice District during the year:—

- (1) For the best block of transplanted pure line seed padi (autumn crop), the area to be not less than half an acre in extent, in the Corentyne District between Villages 47 and 48, and in the Crabwood Creek area.
- (2) For the best miscellaneous farm between Islington and Sisters Villages on the East Bank, the area to be not less than quarter of an acre in extent.

17. In the rice competition run in Villages 47 and 48, seed was given out, nurseries were planted and in some cases transplanting took place. This area, however, is dependent on rainfall for its rice crop and just at planting time the severe drought was experienced. Consequent upon this the competition could not be completed but the awards were made to those farmers who in the opinion of the judges made the best attempt to establish their area. The same difficulty was encountered in the competition in the Crabwood Creek area. Altogether 56 farmers took seed and some of this was sown in areas outside the stipulated district whilst some got mixed with other seed and some was lost through weather conditions. Finally, however, a selection of the best was made and these were continued to the end of the competition.

18. The following awards were made:—

VILLAGES 47 AND 48—CORENTYNE.

1st prize	...	...	(\$15)—Jagessar Singh
2nd prize	...	...	(10)—Ramadheen
3rd prize	...	...	(5)—Seecharan

CRABWOOD CREEK DISTRICT.

1st prize	...	...	(\$15)—Jang Bahadur
2nd prize	...	...	(10)—Gurucharan
3rd prize	...	...	(5)—Bramhadat

19. In the miscellaneous farm competition great difficulty was experienced in getting entries and farms had to be inspected and judged and the best selected for the final judging which was carried out in December. The following awards were made:

1st prize	...	...	(\$15)—H. Archibald
2nd prize	...	...	(10)—H. Benjamin
3rd prize	...	...	(5)—C. Northe

20. In addition to these ordinary competitions, the following special "Flood" competitions were inaugurated.

For the best cultivated mixed provision farms in the undermentioned areas, the area cultivated by each entrant to be not less than one-quarter of an acre in extent.

In the area between Schumacker's Lust to Ithaca.

In the area between Bush Lot and Hopetown Villages.

In the area between Belladrum to Tempie.

In the area between Fryish to Gibraltar.

In the Central Corentyne District.

The prizes were awarded to their respective winners.

Flood Relief Measures.

21. A good deal of extra work was entailed in connection with the re-establishment of areas destroyed by the abnormal weather conditions. In addition to the competitions referred to elsewhere free distributions of planting material, purchased from Flood Relief Funds, were made as shown in the following table.

	Quantity Distributed.	
Padi—bags (140 lb.)	...	300
Black Eye Peas—bags (90 lb.)	...	20
Sweet Potatoes (local) bags—(180 lb.)...	...	6
Eddoes—bags (180 lb.)	...	27
Tannias—bags (180 lb.)	...	22
Tannia bottoms—bags (180 lb.)	...	53
Yams—bags (180 lb.)	...	10
Sweet Cassava—bundles	...	63
Bitter Cassava—bundles	...	130

Co-Operative Credit Banks.

22. There are eight Co-operative Credit Banks in the district, *viz.*:—Eldorado Block, Lichfield, Hopetown and Expectation, West Coast, Berbice, and Bloomfield-Salton, Rose Hall, Eversham and Skeldon on the Corentyne Coast. Regular monthly committee meetings were held in each Bank throughout the year and the general positions of the Banks have been maintained. The posts of Secretary became vacant in the Expectation and the Rose Hall Banks during the year and had to be filled. These Banks are greatly hampered in the good which they could achieve by the shortage of money. In many cases in which the capital is adequate there have been such losses in the past that all working capital has been swallowed up; funds neither exist with which to make new loans, properly secured to honest and genuine farmers nor to pay the costs necessary to recover long outstanding debts.

WHIM SUB-STATION.

General.

23. This station, which exists as a demonstration and seed distribution centre, has proved of invaluable assistance to farmers during the year. A rainfall gauge was installed in February and since then a daily record has been kept of the rainfall. The total rainfall for the year was 36.63 inches. This affords an interesting comparison with the average rainfall for Berbice of 80.78 inches. Demonstrations have been run in the cultivation of cabbages and onions, the pruning and staking of tomatoes, the cultivation of grape vine and the benefits of mulching, etc.

Tomatoes.

24. Comparative tests were to have been made with tomato varieties of Early Market, Bonny Best (Canada), Bonny Best, (U.S.A.) and John Baer, grown from seeds and cuttings sown and planted directly into the ground to obviate any set back caused by transplanting. This trial was progressing favourably, having been set down in February, but on the arrival of the dry spell and the consequent water shortage the plants became subject to disease and the experiment had to be abandoned.

Eschallots.

25. An experiment was in progress at the close of the year on the difference in growth between second generation bulbs and seeds. Seeds from the 1933 crop were stored and sown along with bulbs from the 1934 crop. This experiment will probably be reaped early in 1935.

Cabbages and Cauliflower.

26. The cultivation and economics of the cabbage crop throughout the year are being examined. Small quantities of seeds were sown regularly in boxes and transplanted a month later. Good results were obtained up to August when the water supply failed and no amount of shading or mulching could bring the plants to head properly. This experiment is being continued. An unsuccessful attempt was made to cultivate Benares cauliflower.

Ginger.

27. Three types have been experimented with—Canton, Jamaica and Dominica. The cultivation has not been successful owing to abnormal weather conditions.

Legumes.

28. Eight varieties of edible beans were imported and tried out on the station. These were:—

Henderson's—Old Homestead.	Henderson's—Stringless Bush.
„ Bountiful Bush.	„ Black Valentine.
„ White Marrow.	„ Ford Hook.
„ Ideal White Lima.	„ Bush Lima.

The germination of these was good and all made rapid growth. Their flowering period, however, did not coincide with the growth of the plants and the vines ripened and died before the beans in the pods were mature. This may have been due to weather conditions. Old Homestead and Bush Lima proved to be the two best varieties and further trials are being made with them.

Mesquite.

29. Some seed was obtained and planted first of all as a hedge and later on the boundaries of the plot to produce seeds. The hedge has done well and formed a good barrier but the plants have, as yet, in this their second year of growth, shown no signs of flowering.

Plant and Seed Distribution.

30. In addition to the distributions of planting material, purchased from flood relief funds mentioned elsewhere in the report, the following were distributed during the year.

Padi (seed) ...	...	...	28,700 lb.
Legumes (cover crops) ...	...	...	27 "
Peas and Beans (edible) ...	...	...	36 "
Papaw (seed) ...	...	...	3 "
" (plants) ...	...	...	16 "
Tobacco (seed) ...	...	...	12 oz.
" (plants) ...	...	...	398 "
Tomato (seed) ...	...	...	$\frac{1}{2}$ oz.
" (plants) ...	...	...	738 "
" (cuttings) ...	...	...	56 "
Cabbage (plants) ...	...	...	90 "
Boulangers (plants) ...	...	...	42 "
Eschallots ...	...	...	1 $\frac{1}{4}$ lb.
Sweet Potato (cuttings) ...	...	...	4,975 "

MACAW SUB-STATION.

31. This plot consists of about two acres of African Oil Palms. There are altogether 169 plants which, because of the shade and cool atmosphere supplied by the weed grasses have maintained their growth through the existing very dry year. Cover crops were established, namely pigeon peas and canavalia, but great difficulty in spreading these crops is experienced because the plants do not set seeds satisfactorily. In many cases moulds attack the fruits before the seed pods burst.

A crop of Gros Michel bananas was planted between the palms. These are doing well and suckers will soon be available, if necessary for distribution.

ACKNOWLEDGMENTS.

32. It is necessary here to record appreciation of the work of the staff during my term of office. Sincere thanks are extended to estate proprietors, managers and staff for the interest shown and the help afforded in carrying out experiments and investigations. Thanks are also due to the staff of the Chemical Division for analysis of soil samples and to the other officers of the Department for their co-operation.

JAMES D. GILLESPIE,
Agricultural Superintendent, Berbice.

March 15, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE EAST DEMERARA DIVISION FOR THE
YEAR 1934.

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REPORT OF THE EAST DEMERARA DIVISION FOR THE YEAR 1934.

GENERAL.

1. Mr. C. C. Dowding, F.L.S., F.R.H.S., performed the duties of the Mahaica-Mahaicony District as well as his own from January 30. Mr. W. A. Bovell was appointed to this District on July 1, succeeding Mr. D. D. Haynes, Agricultural Instructor, who left the Colony on promotion for British Honduras on April 7.

2. Mr. E. M. Peterkin, Agricultural Superintendent, supervised the work of the West Demerara District from January 1 to June 30, along with the East Demerara Division. He also administered the Live Stock Division from November 3 to December 31 during the absence, in the Rupununi, of the Government Veterinary Surgeon.

CROP CONDITIONS.

3. The heavy rainfall during November and December, 1933, followed by the extremely heavy rains over the week-end of January 7, resulted in the conservancy rising to an abnormal height, running over the dams and, in many cases, making breaches in the dams of the estates and villages. The water rose in these areas, in some cases, to $2\frac{1}{2}$ feet on the front residential areas, and covered the public road.

4. The Mahaica and Mahaicony creeks overflowed their banks and flooded out all of the rice and savannah area, destroying—by drowning and starvation—large numbers of live-stock. Large quantities of padi stored in the mills were ruined by the water which rose in some mills up to the third tier of bags. The water remained on certain areas for two weeks. The places that suffered most were :—Mahaica, Mahaicony, Cane Grove, La Bonne Mere, Ann's Grove, Clonbrook, Golden Grove, Nabaclis, Plaisance and Beterverwagting. All root crops were destroyed and there was every appearance of a serious shortage of food in the near future. Visits were paid to all of the flooded areas, the amount of damage assessed and immediate steps taken to obtain planting material to re-establish these areas. The Director obtained a supply of black-eye peas and sweet potatoes from the West Indies, cassava sticks, eddoes, tannias and yams from the North West District, and a large consignment of vegetable seeds from America ; these were distributed free. Sub-station Cecilia was used as a nursery for the production of seedlings and sweet potato slips, which were also distributed free of charge.

5. Competitions with money prizes, were started in each village, the principal object being the early establishment of quick growing food crops.

Sugar.

6. At Cane Grove sugar estate the entire cultivation was severely damaged, large areas being entirely wiped out. The cane farmers at Beterverwagting suffered the most as in this village the bulk of the cane is reaped at the end of the year. Buxton took off the bulk of this crop in the early part of the year so that most of their area was well matured. All plants and ratoons under five months were killed, while all cane over that age suffered little apparent loss. Canes cut in November however, had such a low quotient of purity that reaping had to be suspended. At Beterverwagting a large area of rice land that had been planted to cane in the previous October-November was entirely wiped out ; and a scarcity of planting material has retarded its re-establishment.

Rice.

7. There was a shortage of good seed for planting the autumn crop. Large quantities of padi stored for seed purposes were ruined by the January floods and germination generally was poor. The prolonged dry season following the rains

prevented planting at the usual time; large areas of nurseries sown for transplanting were lost due to the non-arrival of the rains. Planting continued up to the end of August; all of this late padi suffered severely from shortage of water, considerable areas dying out. Red and other undesirable types of grain were very evident during the autumn crop; the floods seem to have thoroughly distributed, by flotation, early maturing undesirable types left on the land from the previous crop.

8. The autumn reaping was distributed over a very prolonged period starting in September and finishing about the middle of December. The November and December rains caused very little loss but hampered milling somewhat. On the whole weather conditions were better than was expected. The Mahaica-Abary area which is entirely dependent on rainfall, suffered severely on account of the very late arrival of the rains and in some places entire areas were lost. There was hardly one farmer who did not lose at least 50 per cent. of his crop.

Minor Crops.

9. *Cassava*.—This crop, with the exception of what could be immediately reaped, was entirely destroyed; the supply of planting material to re-establish it was a difficult problem but was gradually overcome.

10. *Tannias and Eddoes*.—The bulk of these were destroyed, and the same difficulty arose with planting material.

11. *Sweet Potatoes*.—The area under sweet potatoes was a total loss, but has since been re-established.

12. *Coconuts*.—A few plants died and the trees on flooded areas shed their nuts badly; considerable damage was done to young cultivations by cattle, but fortunately was not of a permanent nature.

13. *Plantains and Bananas*.—A large number of these fell and some clumps died out entirely. The majority survived with the loss of most of their leaves, resulting in very small bunches of poor fruit, and a consequent shortage of fruit for many months. There was, however, no real shortage of planting material.

14. *Vegetable Gardens*.—These were entirely destroyed and a shortage of seed prevented their re-starting for a few months; the majority of these, although retarded by the dry weather, are now doing well.

15. *Fruit Trees*.—The majority of the Avocado pears and breadfruit perished. It was surprising how the citrus stood up to it. Star-apples, sapodillas, mangoes, genips, etc., suffered badly.

Live Stock.

16. The loss of all kinds of live stock was severe, the greater part dying from hunger and exhaustion; this may be a blessing in disguise, as the majority destroyed were of poor and undesirable type.

EXPERIMENT STATION—GEORGETOWN.

Ground Provisions and Vegetables.

17. *Bananas*.—The variety collection remains as it was listed in 1933.

18. 2,000 suckers mostly Gros Michel were received in April from the Agricultural Superintendent, Berbice, and planted in Section D, South Field, as a nursery 3 ft. x 3 ft. apart. The growth made by these suckers is very poor; the long spell of dry weather may be the cause of this.

19. *Plantains*.—The varieties under cultivation are as follows:—Apple, Surinam, Horse, Giant, Black, Pink and White.

Mangoes.

20. The collection of grafted mangoes in South Field now consists of the following :—

Julie	...	...	24 (3 from Trinidad)
Mrs. White	...	...	3
No. 11 (Jamaica)	...	...	5
Mrs. Dare	...	...	1
Graham	...	...	2
Pere Louis	...	...	3
Bombay (Essequibo)	...	...	3
Peach	...	...	4
Bangalore	...	...	1
D'Or	...	...	2
Ceylon	...	...	1
Colonial Bank	...	...	1
Clementi	...	...	1
Purple Bombay	...	...	1

The following from Dominica were added to the collection during the year:—

Divine	...	...	2
Peters or Bombay	...	...	1
Lorieau	...	...	1
Cambodiana	...	...	2
Cherie	...	...	2

During the year the two Bombay Purple, the one D'Or and one Rowland mentioned in the 1933 report died. Julie, No. 11, Mrs. White, Mrs. Dare, Essequibo Bombay and Graham fruited during the year.

Tobacco.

21. Seed from the following varieties planted in 1933 was collected and distributed :—Yellow Mammoth, Kentucky One Sucker, Comstock Spanish, White Burley and Hickory Pryor. The demand for seed has been greater than usual. The majority of applicants have never grown tobacco before, and the usual demand is for sufficient seed to plant five acres; it takes a lot of persuasion to convince them that tobacco is a crop which requires constant attention and that it is wiser to grow a few hundred plants as a first effort and thus learn something about this crop before they branch out on a large scale.

Fibres.

22. *Manilla Hemp*—The very dry weather during most of the year was detrimental to the growth of this crop, large numbers of clumps died. The experiment has been discontinued.

Green Manures and Fodder Crops.

23. The most promising of these for orchards is *Indigofera endecaphylla*. This has maintained a good cover on the same area for three years. It has for the first time started to flower.

24. The rice bean (*Phaseolus calcaratus*) obtained from New South Wales has done well. Only very small areas of the following are being grown :—*Crotalaria spectabilis*, *C. usaramoensis*, *C. juncia*, *C. striata*, C.sp., *Canavalia ensiformis*, *C. gladiata*, *Indigofera hirsuta*, *I. endecaphylla*, I.sp., *Dolichos hosei*, *Centrosema pubescens*, *Calapagonium mucunoides* and *Pueraria jaranica*.

25. The area which was planted in the south field under fodder crops has been abandoned, cultivation being carried on in the livestock section.

SUB-STATION CECILIA.

26. The January floods destroyed everything growing on this station with the exception of the grape vines. The station was used, after the water subsided, as a

nursery for growing a quick supply of seedlings and cuttings to distribute to farmers; this was done until after the end of June when it was gradually brought back into cultivation. Water was turned in during October with the assistance of Mr. Harrington of the pure water supply scheme. The total number of visitors to the Station during the year was 1,329.

Tomatoes.

27. Plots of the following varieties were planted from seed obtained in 1933 from Messrs. Sutton & Sons, England, Messrs. Peter Henderson & Co., U.S.A. and Messrs. Ewing & Co., Canada.

28. The following table gives all data in connection with same.

TABLE I.

Country of Origin.	Variety.	Date Sown.	Date Transplanted.	Reaping Period.	No. of Stems.	Area sq. ft.	Yield per Plot lb.	Yield per Acre lb.	Prevalence of Blossom-end rot.	Prevalence of Mosaic.
U.S.A.	... Marglobe	26.1.34	21.2.34	5.4.34 to 12.6.34	2	220	48	9,504	Nil	Nil
U.S.A.	... Bonny Best	26.1.34	21.2.34	10.4.34 to 14.6.34	2	220	61	12,078	Slight	Nil
Canada	... Bonny Best	26.1.34	21.2.34	10.4.34 to 18.6.34	2	220	69	13,662	Nil	Slight
Canada	... John Baer	26.1.34	21.2.34	10.4.34 to 14.6.34	2	220	67	13,266	Slight	Slight
England	... Early Market	26.1.34	21.2.34	10.4.34 to 14.6.34	2	220	147	29,106	Nil	Very slight

29. There is a growing demand for seed and seedlings, especially of the Early Market variety.

30. Another trial was carried out with fresh seed obtained in 1934 as shown in the following table, when some new varieties from Canada were tried; these plots suffered severely from the prolonged dry weather.

TABLE II.

Country of Origin.	Variety.	Date Sown.	Date Transplanted.	Reaping Period.	No. of Stems.	Area sq. ft.	Yield per Plot lb.	Yield per Acre lb.	Prevalence of Blossom-end Rot.	Prevalence of Mosaic.
England	... Early Market...	19.6.34	17.7.34	11.9.34 to 8.11.34	2	440	53	5,742	Very Slight	Slight
U.S.A.	... Marglobe	19.6.34	17.7.34	29.9.34 to 8.11.34	2	440	22	2,178	do.	Nil
U.S.A.	... Bonny Best	19.6.34	17.7.34	11.9.34 to 8.11.34	2	440	38	3,762	do.	Slight
Canada	... Labrador Early	19.6.34	17.7.34	11.9.34 to 8.11.34	2	440	47	4,653	do.	Nil
Canada	... Red Sparks Earliana	19.6.34	18.7.34	11.9.34 to 8.11.34	2	440	37	3,663	do.	Nil
Canada	... Grand Rapids..	19.6.34	18.7.34	11.9.34 to 8.11.34	2	440	52	5,147	do.	Nil

Onions.

31. The onion seed sown at the end of 1933 was entirely destroyed by the January flood. Seed obtained from Teneriffe and kept in cold storage was sown as under.

Variety.	Date Sown.	Date Transplanted.	Date Reaped.	Area sq. ft.	Yield per Plot lb.	Yield per Acre lb.
Red	23.6.34	1.8.34	8.11.34 to	288	32	4,840
White	23.6.34	1.8.34	14.12.34 to	288	25	3,780

These plots suffered from the prolonged dry weather.

Fifty mature onions of each kind reaped from these plots were resown on 20.11.34 with the object of seeing if they will seed.

32. Plots were sown from fresh seed imported from Teneriffe in November, results from which will be available in 1935.

33. The following varieties of onions were imported and grown for the Plant Breeder who is studying this crop.

Red Bombay from Montserrat—sown June 21, transplanted June 27. Some of these plants died and were reaped on October 19; these were replanted on December 13. The remaining plants in the original plot flowered on December 24.

Red Madras from the Imperial College, Trinidad—sown June 21, transplanted June 27; some were reaped October 19 and were replanted December 13, the remainder in the original plot flowered on November 29.

Red Bombay from Montserrat—received on November 15, sown November 20 and transplanted December 27.

White Nasik from Montserrat—received November 15, sown November 20 and transplanted December 28.

Red Globe from Montserrat—received November 15, sown November 20, transplanted December 27.

White Patna—received from Suttons, England, November 16, sown November 20; the germination was very poor and all seedlings died before they could be transplanted.

Soya Beans.

34. The plot of 770 sq. feet sown in November 1933 was ruined by the January floods; sufficient seed, however, was collected during March to plant a new plot. This was sown on August 8 in a plot of 380 sq. ft., reaped from November 12 to 27 and gave a yield of 45 lb., equal to 5,091 lb. per acre. An area of 518 sq. ft. was sown on December 1, the germination was good.

35. This variety has been under trial since 1928 and is undoubtedly becoming acclimatised. The viability of stored seed is improving; the unshelled seed retains its viability for a much longer period than when shelled.

Legumes.

36. Legumes as a cover crop do not interest the farmers, only legumes of dual purpose type, *i.e.* both food and cover, can they be persuaded to grow; therefore, considerable attention has been paid to this type. The runner Lima, Bush and Dwarf Bonavist are becoming popular with the farmers.

37. With reference to the collection listed in the 1933 report, only the Venezuelan Black bean from Puerto Rico (which is the same as our well known black seeded Sinebone), and Bush Lima No. 3 from Nigeria have survived.

38. Trials were made with the following varieties imported from Messrs. Henderson & Co., U.S.A. :—

Variety.	Date Sown.	Area sq. ft.	Reaping Period.	Yield per plot.	
Fordhook—Bush Lima ...	...	19.6.34	576	1. 9.34 to 29.9.34	8 os.
Ideal Pole—Lima ...	...	19.6.34	576	31.8.34 to 29.9.34	9 "
Bush Lima ...	...	19.6.34	576	22.8.34 to 1.10.34	17 lb. 6 "
White Marrow—Bush Bean ...	...	19.6.34	576	22.8.34 to 12.9.34	1 lb. 12 "
Black Valentine—Bush Lima ...	...	19.6.34	576	31.8.34 to 12.9.34	2 "
Old Homestead ...	...	19.6.34	576	31.8.34 to 12.9.34	2 lb.
New Stringless ...	...	19.6.34	576	31.8.34 to 12.9.34	3 "
Bountiful ...	...	19.6.34	576	18.8.34 to 4.9.34	1 lb. 12 "

Bush Lima, Old Homestead and Bountiful are being resown, the rest have been discarded.

39. Seed of Popondo P.3 was received from the Department of Agriculture, Nigeria on May 30; the germination was poor, the seedlings weak and all died before fruiting. Seed of the following beans were obtained from the Department of Agriculture, Trinidad :—Madagascar, Danubin and Ohtenashi. These were sown on November 27; the Ohtenashi failed to germinate, but the others are making fair growth.

40. A collection has been made and plots sown of the following beans, seed of which has been obtained locally :—Sinebone (black), Sinebone (white), Lima No. 3, Bush Lima, Old Homestead, Bountiful Bush Bean, Mung, Black Eye Peas, Waby bean, Urid, "Demerara River," Yard bean (white), Yard bean (green), Yard bean (long), Variegated Lima bean, White Lima bean, Dwarf Bonavist, Bush Bonavist. These were sown on December 22, each plot being 198 square feet.

Other Crops.

41. *Sweet Potatoes*.—The sweet potatoes imported from Trinidad as a flood relief measure proved to be mixed and did not yield satisfactorily. Attention is being confined to the Barbados Black Rock which the farmers report as a good yielder of attractive tubers.

42. *Chinese Yams*.—Two lots of this yam are being grown, one from Trinidad and one from St. Lucia; these were replanted on June 22 from the tubers left after the flood. The growth has been fair and these will be reaped in March 1935.

43. *Grapes*.—These suffered severely from the January flood, but have made a good recovery, they were pruned in December with the object of obtaining fruit for the Agricultural Show to be held in April 1935.

DISTRICT WORK.

Cane Farming.

44. The re-establishment of the sugar cane farms after the floods was a difficult problem as there was a scarcity of planting material even on the sugar estates, but this was gradually overcome by husbanding and utilising all the planting material available. It is hoped that by June 1935, losses will not only have been made good, but the area under farmers' canes will have extended.

Plaisance village has made a start in cane farming and about 10 acres are being planted. 3,000 plants of Diamond 10 were given them by the Department to start a nursery.

Rice.

45. The spring crop this year was destroyed by the floods and any rice which survived was eaten by starving stray cattle. The extension of the pure line area in the Mahaica-Abary district received a severe setback through the loss of padi caused by the floods. Considerable quantities of stored seed padi were wet and ruined in the mills; consequently, any kind of padi was used for sowing. The Department and the District Commissioner purchased and distributed free 587 bags of good quality padi. The standard of pure line on the Lower East Coast has been well maintained. No. 79 is popular, but there are some growers of Demerara Creole such as Hope, La Bonne Mere and Fairfield who still believe in that variety. The five acres of land rented at Pln. Nonpareil were planted this year with No. 79. This yielded 155 bags of 140 lb. each. When in full bearing this plot presented a striking appearance and attracted much attention.

Minor Crops.

46. *Plantains*.—There was a shortage of this fruit during the early part of the year, but by the end of the year normal conditions again prevailed. The few

farmers who were not flooded out made good money. The area under this crop has been increased.

47. *Bananas*.—The visit to the Colony of the United Fruit Company's representatives, Messrs. Dunlap and Sanderson, made farmers optimistic as to the possibilities of growing bananas, and great interest was evinced for a time, mostly by the village politicians. In this District there are no regular cultivations of the crop, bananas of all kinds being intermixed with plantains and other crops. The variety known as Cayenne is undoubtedly Gros Michel, but there is no pure stand of it to be found anywhere. The advice to farmers has been to increase the number of their plants and to plant only Gros Michel, (there is an active local market which can absorb an increased output) so that there will be a supply of planting material if and when required.

48. *Ground Provisions*.—There is a large area under cassava and eddoes tannias are also being cultivated recently. Very keen interest is being taken in sweet potatoes. The Black Rock introduced by the Department is being largely grown and is a great favourite.

49. *Tomatoes*.—The distribution of seed and seedlings from sub-station Cecilia has created and is maintaining an interest in this crop. Farmers are realising the benefit of growing good seed.

50. *Peas and Beans*.—Considering the quantities of seed given away free every year and the amount of propaganda work put in by the Officers of the division, it is surprising how little interest is taken in the growing of legumes; efforts are, however, still being made to interest the farmers.

51. *Onions*.—The January floods destroyed all the onions then growing in the district; the demand for seed this year has fallen off as a consequence.

Lodge Allotments.

52. The January floods affected this area but the damage done was not great. The long spell of dry weather immediately following did much more harm. The end of the year rains have improved things considerably, and, with the exception of a few lots, the area has never presented a more pleasing appearance. There are still a few of the original holders, others come and go. There has been no money allocated for the purchase of seeds or planting material, but these have been supplied when available. In the early part of the year seeds and plants were supplied from the Flood Relief Fund, and the farmers are now more or less self supporting. Difficulty is still being experienced in getting the allotment holders to clean their drainage and irrigation trenches. On the whole, after much effort, progress is fairly satisfactory.

School Gardens.

53. The school garden, started at the Wesleyan School at Buxton in 1933, has made excellent progress, and the headmaster Mr. R. Baird is to be congratulated on winning the first prize in the school garden competition this year, which was run by the Education Department. Seeds and seedlings have been supplied free of charge from time to time.

Competitions.

54. *Flood Competitions*.—With the object of assuring a food supply as early as possible after the floods, mixed provision competitions were started in all the villages of the East Demerara District, special stress being laid on the early establishment of these plots and the inclusion of quick maturing crops. The prizes were divided into a number of small money prizes, instead of the usual first, second and third prizes, so that a greater number of people would benefit.

55. For the best cultivated mixed provision farm in the district, the area cultivated by each entrant to be not less than half-an-acre, in the following districts:—

In Plaisance and Victoria Villages :

Two prizes of \$6 each ; two prizes of \$5 each ; two prizes of \$4 each.

In Beterverwagting and Buxton Villages ;

Three prizes of \$8 each ; four prizes of \$5 each ; four prizes of \$4.

In Ann's Grove Village and Mahaica District :

Two prizes of \$6 each ; four prizes of \$5 each ; two prizes of \$4 each.

In Golden Grove Village ;

Three prizes of \$6 each ; five prizes of \$4 each ; four prizes of \$3 each.

The farms were judged on the following points :—

Early establishment of area	...	...	40
Extent of area cultivated	...	...	20
Cultural operations	...	...	20
Drainage	...	...	20

The judging was expected to close by April 30, but owing to the difficulty of obtaining planting material the date of judging had to be extended.

56. Ann's Grove and Mahaica were the two first to be completed in May. The response here was excellent and some extremely good work was done. Plaisance, Golden Grove and Victoria were completed in June. The response in these villages was very good, particularly at Plaisance. It is pleasing to report on the improvement in the condition and the increase of the area under cultivation in this village. The judging at Buxton and Beterverwagting was not completed until August, no effort was made to start early and the number of entrants was very small. The abundance of available work caused by the Flood Relief in these villages and the repairing of the sea defence breach was mainly responsible for this.

57. *Rice*.—During the year two rice farmers' competitions were held in the East Demerara District, one on the Lower East Coast and one in the Mahaica-Abary District, the conditions in each district being as under :—

For the best block of transplanted pure-line seed padi, the area to be not less than half-an-acre :

1st prize	...	...	...	\$15
2nd „	...	...	...	\$10
3rd „	...	...	...	\$ 5

58. The varieties of padi used were Demerara Creole and No. 79. In the case of new entrants pure line seed was supplied by the Georgetown Station, while a small quantity was grown by the competitors and came up to the Department's required standard of purity.

59. The padi blocks were judged on the following points :—

General layout and preparation of nurseries and beds	30
Uniformity of type and freedom from red grains	20
Freedom from weeds, pests and diseases	10
Yield	40

The padi had to be threshed and not bull-mashed, and the crop reaped was to be sold as far as possible for seed purposes.

60. The competition on the Lower East Coast was well supported. There were 92 entrants made up as follows :—Nonpareil 20, Hope 52, Clonbrook 19, Helena 1. The varieties grown were Demerara Creole and No. 79, the seed being supplied free by the Department. The delay of the May-June rains caused considerable anxiety among the farmers and many who would have competed did not do so. The rules governing the competition were carefully explained and the

majority of entrants carried out the instructions given them. Keen interest was evinced throughout the competition by outsiders as well as entrants. Although reaped late, the arrival of the end-of-year rains enabled all of the competitors to reap their padi.

61. The prizes were awarded as under :—

1st prize	...	(\$15)—Jaipaul, Clonbrook.
2nd „	...	(\$10)—Muradalli, Nonpareil.
3rd „	...	(\$ 5)—Nagasar, Hope.

62. The rice competition on the Upper East Coast was not a success. There were only three entrants ; this was entirely due to shortage of water, and the three who persevered and came through deserve credit. The prizes were awarded as under :—

1st prize	...	(\$15)—G. R. Kanhai, De Hoop.
2nd „	...	(\$10)—P. Madray, Mahaicony.
3rd „	...	(\$ 5)—Maharanie.

Flood Relief Measures.

63. A considerable amount of extra travelling and work was necessary in connection with the re-establishment of areas destroyed by the floods. Free distribution of planting material was made possible through Flood Relief Funds. The following table shows the distributions in the East Demerara District :—

	Q u a n t i t y distributed
Padi—bags (140 lb.)	... 587*
Black Eye Peas—(bags (90 lb.)	... 79
Sweet Potatoes (local bags (180 lb.)	... 1
„ (Trinidad) bags (180 lb.)	... 29
Eddoes—bags (180 lb.)	... 78
Tannias—bags (180 lb.)	... 43
Tannia Bottoms—bags (180 lb.)	... 60
Yams—bags (180 lb.)	... 13
Sweet Cassava—bundles	... 134
Bitter „ „	... 216

Crop Pests.

64. *Sugar Cane.*—Aphis was very prevalent at Beterverwagting. Numbers of Coccinellidae (Lady Birds) were observed feeding on them and this probably prevented the outbreak being a serious one.

65. *Coconuts.*—There was a serious outbreak of *Brassolis* at Springhall which was very efficiently handled by Mr. Boodhoo, Jr., assisted by the Department. Parasite control has been installed. There was also a serious outbreak at Chapman's Grove and much damage was done before the collection of caterpillars was started. There were several small outbreaks at various other places. Several small owners will not practise any control measures and are a serious menace to the district.

66. *Plantains and Bananas.*—A small beetle has been causing considerable damage to both these crops, the fruit is disfigured and rendered practically unsaleable. The Entomologist is carrying out investigations at Beterverwagting in connection with this.

67. *Rice.*—Birds are causing considerable damage in the rice fields. There are numbers of small birds that squeeze with their beaks the tip of the grain while in the milk stage. This, when mature and milled, is discoloured at the tip and adds very appreciably to the percentage of discoloured grains, thus reducing the grade of the rice. The farmer does not realise the extent of damage done by birds, it is the miller who suffers. It is impossible to tackle this pest during the autumn crop ; the

* Includes 337 bags purchased for District Commissioner.

area is large and the birds are scattered, but if half-acre plots were put in during the spring on areas where no padi is grown, it would act as a trap and large numbers could be destroyed by shooting.

68. *Praedial Larceny*.—This is one of the most serious pests the farmer has to combat. One hardly ever visits a village without hearing complaints. It is extremely prevalent in all ground provision and coconut areas and is deterrent to development of general farming in East Demerara. There are many payable small crops that farmers could grow, but they do not think it worth their while to grow them for others to reap.

Co-Operative Credit Banks.

69. The Agricultural Superintendent continued the Chairmanship of the Plaisance-Sparendaam, Beterverwagting-Triumph, Buxton-Friendship and the Georgetown Co-operative Credit Banks during the year. Monthly meetings were held at each bank; numerous visits had also to be paid to deal with other business.

70. The damage caused by the January floods affected the circulation of money to a large extent as there were no crops to convert into cash, even the re-opening of the sea defence work and the village flood relief works did not off-set this, so that repayment of loans has been slow; it is expected that this will be remedied during 1935.

71. Mr. C. C. Dowding, Agricultural Instructor, also continued the Chairmanship of the following Banks:—Ann's Grove, Golden Grove and Victoria.

SEED DISTRIBUTION.

72. Plants, cuttings and seeds of field crops distributed from the Central Station alone during the period under review, are given in the following summary, which does not include special flood relief distributions listed elsewhere.

Padi (seed) ...	...	...	73,920* lb.
Padi (seedlings) ...	...	...	260,000
Peas and Beans ...	...	...	50 "
Legumes (cover crops) ...	...	...	65 "
Tobacco ...	...	...	2 "
Banana suckers ...	...	...	2,031
Plantain suckers ...	...	...	33
Sweet Potato (tubers) ...	...	...	10,240 "
Onion ...	...	...	60 "
Tomato ...	...	...	2½ "
Vegetable seed (assorted) ...	...	...	20 "
Pepper (plants) ...	...	...	300
Seed Coconuts ...	...	...	18
Lime (plants) ...	...	...	56

FODDER PLANTS.

Demerara Primrose...	...	...	700 plants
Guatemala Grass ...	...	...	1,120 cuttings
Guinea Grass ...	...	...	100 "
Wynne Grass ...	...	...	6 oz. seed

73. The following plants, seeds and cuttings were distributed from Sub-Station Cecilia during the year:—

Grape vine (plants)...	...	...	89
Sweet Potato (cuttings) ...	...	...	101,520
Sweet Potato (tubers) ...	...	...	500 lb.
Jerusalem Artichoke ...	...	...	4 "
Tomato (seedlings)...	...	...	8,465
Tomato (fruit) ...	...	...	92 "
Tomato (seed) ...	...	...	5½ oz.
Onion (seedlings) ...	...	...	6,400

* Supplied by the Plant Breeder.

Cabbage (seedlings) ..	...	...	594
Boulanger (seedlings)	...	...	75
Boulanger (seed) ...	...	...	7 oz.
Pumpkin (seed) ...	...	...	$\frac{1}{2}$ lb.
Squash (seed) ...	...	...	$\frac{1}{2}$ oz.
Papaw (seed) ...	...	...	$\frac{1}{4}$ "
Papaw (seedlings) ...	...	...	18
Ginger ...	...	...	$1\frac{1}{4}$ "
Sweet Corn ...	...	...	$\frac{1}{2}$ "
Soya Beans ...	...	...	12 lb.
Dwarf Bonavist ...	...	...	5 "
Mung ...	...	...	6 "
Urid ...	...	...	2 "
Sinebone ...	...	...	$4\frac{1}{2}$ "
Lima Bean ...	...	...	19 "
Waby Bean ...	...	...	$1\frac{1}{2}$ "

and small quantities of seed of Ochro, Melon, Cucumber, Mustard and Lettuce.

SEED AND PLANT INTRODUCTION.

74. The undermentioned seeds and plants were received during the year for general trial. The list does not include padi and other seeds received by the Plant Breeder and mentioned in his report.

Sweet Potato—50 bags—from Trinidad.

Black Eye Peas—2,000 lb.—from U.S.A.

Ginger—"Jamaica" and "Canton"—78 lb.—from Trinidad.

Pigeon Peas— $1\frac{3}{4}$ lb.—from Trinidad.

Collection of Vegetable Seed—from the United Kingdom.

Collection of Vegetable Seed—from the U.S.A.

Sweet Corn—3 oz.—from Puerto Rico.

Tomato "Labrador Extra Early Red," "Sparks Earliana," and "Grand Rapids"— $8\frac{1}{2}$ oz.—from Canada.

Tomato "Marglobe" and "Bonny Best"—12 oz. from U.S.A.

Tomato "Early Market," "Best of All" and "Satisfaction"—1 lb.—from the United Kingdom.

Onion—"Red" and "White"—60 lb.—from Teneriffe.

Beans—Popondo (*Phaseolus lunatus*)—4 oz.—Nigeria.

Rice Bean (*Phaseolus calcaratus*)—2 lb.—Australia.

Cassava "Bacuit" and "White"—20 cuttings—Philippines.

Tobacco "Kentucky One Sucker," "Yellow Mammoth," "Hickory Pryor" and "Comstock Spanish"—from U.S.A.

Tobacco "Kentucky One Sucker," "Yellow Mammoth" and "Hickory Pryor"—from Trinidad.

Wynne Grass—5 lb. seed—from Jamaica.

E. M. PETERKIN,
Agricultural Superintendent.

March 15, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE WEST DEMERARA AND EAST BANK DISTRICTS
FOR THE YEAR 1934.

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REPORT OF THE WEST DEMERARA AND EAST BANK DISTRICTS FOR THE YEAR 1934.

Mr. J. D. Gillespie, Agricultural Superintendent, who had been granted six months' leave of absence on full pay, in 1933, returned to the Colony on May 17, 1934. He was then transferred to the Berbice District and Mr. A. A. Abraham, Assistant Superintendent who had been stationed in the Essequibo District, was transferred to West Demerara and assumed charge of the District.

GENERAL.

2. The year 1934 was one of abnormal weather conditions. The unusually heavy rains from October 1933 culminating in January, 1934, in approximately 33 inches on the West Coast and 27 inches on the West Bank, resulted in flood conditions and widespread damage to crops. In addition, after the flood rains ceased in January, the rainfall was abnormally low until October and the drought conditions were responsible for further crop losses. The lack of the mid-year rains operated against the growth of the cane crop and lower field returns were obtained in the autumn crop, while plantings in the autumn rice crop were considerably curtailed.

CROP CONDITIONS.

Sugar.

3. The area under cultivation with sugar-cane was 14,688 English acres as compared with 15,423 English acres in 1933. Of this amount 12,361 acres were reaped yielding 27,725 tons sugar. The sugar yield was 2.24 tons per acre as compared with 2.32 tons per acre in 1933. After the heavy rains in January, the rainfall for the rest of the year was considerably below normal and this has resulted in lower cane yields per acre on areas reaped for the autumn crop. Cane farming is not extensively carried on in the district. At Good Intent and Sisters Villages a few acres are grown and 25 tons of canes were sold to Plantation Wales. Interest in cane-farming, however, increased during the year as the price contracted for farmers canes, (\$2.20 per ton) was fixed when sugar prices were well over \$40.00 per ton f.o.b. for the greater part of 1934, sugar prices were little over \$32.00 to \$34.00 per ton f.o.b.

4. The fly *Metagonistylum minense* (introduced from the Amazon region as a parasite of the small moth-borer, of sugar-cane, *Diatraea saccharalis*), has been bred, liberated and recovered in the field on the sugar estates in the district. The control effect is awaited with interest.

Rice.

5. The loss of the spring crop, as a result of the floods, was almost complete and the delayed mid-year rains were the cause of a much curtailed acreage being planted for the autumn crop. The total area reaped in West Demerara was 9,201 acres yielding 141,892 bags of padi as compared with 11,069 acres in 1933 from which 169,338 bags of padi were obtained. On the East Bank, 22 acres were reaped yielding 212 bags of padi. Rice prices were low in 1933, but after the severe crop losses in early 1934, prices rose sharply. It is unfortunate that these prices again declined before the bulk of the autumn crop was harvested.

6. The system of collecting samples of rice to be afterwards forwarded to the Grading Officer, Georgetown, was continued by the Agricultural Officer during the year.

Coffee.

7. The area under coffee in 1934 in West Demerara was 1,554 acres as compared with 1,657 acres in 1933. The area on the East Bank was 10 acres, as compared with 94 acres in 1933. The loss on coffee farms in the Polder areas of Nos

1 and 2 Canals as a result of flood and water-logged conditions was extensive. Coffee prices declined still further and even the end-of-year rise in price which is normally to be expected failed to materialise. The coffee export market has been sluggish for most of the year and the f.o.b. prices quoted ranged from 5 to 5½ cents per pound.

Cacao.

8. The area under cacao in West Demerara in 1934 was 1,179 acres as compared with 291 acres in 1933, while 168 acres were returned on the East Bank as compared with 333 acres in 1933. There are now only a few sites on which moderately pure stands of cacao can be found. Cacao is produced only for the domestic market.

9. Witchbroom disease, *Marasmius pernicius*, is prevalent in the cacao areas, but probably, on account of the prolonged drought season the effects have not been as marked as in other years. A moderately extensive area in cacao at Pln. Middlesex was again brought under cultivation during the year.

Citrus.

10. The area under citrus in the West Demerara was 173 acres, and 38 acres on the East Bank, which was practically the same as the preceding year. During 1934, there were increased plantings of budded plants obtained from the Department's nurseries. In addition, private nurseries have been established under the supervision of the Department.

Tobacco.

11. Interest in this crop increased, especially in the "bright-leaf" types for which attractive prices were being offered by a local cigarette manufacturing company, viz :

For first quality leaf...60c. per lb.				
„ second	„	„	...40c.	„ „
„ third	„	„	...30c.	„ „

The crop continues to be planted only on small "house plots." As tobacco is normally planted with the end-of-year rains, the floods were responsible for a reduction in sowings and despite the high prices offered, the total production was small.

DISTRICT WORK.

Sugar.

12. The details of experiments with sugar cane in progress in this District are given in the report of the Cane Agronomist.

The Agricultural Officer collaborated with the Sugar Experiment Station in reaping Field 75Z, Plantation Uitvlugt. This manurial trial, which was reaped as a second ratoon, has now been completed.

Rice.

13. Eight acres of pure line seed padi, variety No. 79, were grown at the Department's seed farm at La Jalousie. Two hundred bags were reaped and earmarked for organising private seed farms throughout the district for the 1935 autumn crop. For sowing the 1934 autumn crop, one hundred and seventy-five bags of pure line Demerara Creole were issued on the padi loan system. In addition, one hundred bags of good commercially grown padi were distributed for seed purposes as, on account of flood conditions, it was impossible to meet the whole demand for pure line seed. It is anticipated that the areas under private pure line seed farms, which are to be extended in accordance with the 1935 West Demerara padi programme, will lessen the chances of the intermixing of varieties in the field and factory. An attempt is being made to establish in the district a pure stand of No. 79.

Cacao.

14. Under instructions from Head Office a search for trees which might prove immune or resistant to Witchbroom Disease is being undertaken. Certain trees have been selected in various parts of the district, pruned and kept under observation. Seed from trees found to be free from the disease will, in due course, be collected and the progeny further kept under observation. Advice was given in connection with methods for improved drainage, light forking around the trees, removal of suckers, reduction of shade, cutting out of canker, and W.B. pruning, etc.

Citrus.

15. During 1934, 87 orange and 47 grapefruit budded plants were distributed in West Demerara from the Botanic Gardens nurseries and 158 orange and 112 grapefruit on the East Bank from the same source. Two nurseries have been established in the district, one at Plantation De Kinderen, West Coast, Demerara and one at Le Desir, Canal No. 1. At the former nursery, 2,000 seedlings were put out in nursery beds during October and November and were making good progress. At Le Desir, 500 seeds were sown in October. The work is done under the immediate supervision of the District Agricultural Officer.

Pineapples.

16. The pineapple concessions at Dalgin on the Demerara River were visited in September in connection with the manurial experimental plot which is under the control of the Department. Full details in connection with this experiment are given in the report of the Chemist-Ecologist. A spraying experiment with 2% Ferrous Sulphate has also been conducted in order to supply an apparent iron deficiency.

Onions.

17. Efforts were made during the year to increase interest in onion production especially to meet local requirements. Many of the light soil areas in the district, on account of their comparative proximity to Georgetown, frequently offer profitable occupation in the form of vegetable gardening. Seventy-seven ounces of onion seed imported from Teneriffe were distributed to farmers. Most of this was planted with the end-of-year rains.

School Gardens.

18. There are five school gardens established in this district—Blankenburg, Stewartville, Christianburg, Vauxhall and Midenburg Schools—although the only registered garden is at Stewartville which receives a grant from the Agricultural Department. In July these gardens were judged in accordance with the Education Department's scheme of annual awards to schools and pupils for good work in gardening. The awards were made on the recommendations of the Director of Agriculture. The prize of \$5 was awarded to Stewartville C. School and prizes to the value of \$1.50 each were awarded to the following individual pupils who showed marked keenness in the wording of their respective school gardens: Allan Leander and Hubert Aneur of Stewartville C. School, Sylvestine Calderie of Blankenburg C. School. These gardens are serving a very useful purpose in the programme of agricultural education. During the year, both teachers and pupils have worked well in maintaining the cultivation of the garden crops and it is to be recorded that they have shown much enthusiasm and a marked aptitude for this part of their curriculum.

Competitions.

19. The following agricultural competitions were held in West Demerara during the year :—

Flood Relief Competition.—For the best cultivated mixed provision farm in Canals No. 1 and No. 2 and on the West Coast, the area to be cultivated by each entrant to be not less than half an acre in extent. The prizes for each section were :—

Two prizes of \$6.00 each; four prizes of \$5.00 each; two prizes of \$4.00 each.

The farms were judged on the following points:—

Early establishment of area	...	...	20
Extent of area cultivated	...	...	20
Cultural operations	...	...	20
Drainage	...	...	20

There were fifty-one entries for these competitions as follows: Canal No. 1, 9; Canal No. 2, 41; West Coast 1.

20. The final results at the conclusion of the competitions are shown in the following table:—

CANAL NO. 1.

Names.	No. of Points.	Awards.
Jos. Smith	95	\$ 6 00
Dan Souvener	95	6 00
H. D. Mentore	90	5 00
R. Dey	90	5 00
Thos. Davis	90	5 00
S. Souvenir	90	5 00
N. Souvenir	85	4 00
W. Dandar	85	4 00

CANAL NO. 2.

I. Prince	100	6 00
Bhagwandat	95	6 00
E. R. Somai	90	5 00
Mohabir	90	5 00
Bholasingh	90	5 00
M. R. Lam	85	5 00
Gangadeen	80	4 00
Dilloo	80	4 00

21. *Tobacco Competition.*—This competition was carried out under the auspices of the Guiana Match Factory with a view to encouraging cigarette tobacco cultivation in the Colony. Seeds were distributed to twenty-seven persons, but owing to unfavourable weather conditions, disappointing results were obtained. The prizes offered by the Company for the best plots of cigarette tobacco were:—First prize \$10; Second prize \$6; Third prize \$4. The judging was done by the Assistant Agricultural Superintendent. The prize-winner of this division was Mr. S. H. Broodhagen of Vreed-en-Hoop who was awarded the first prize.

22. *Padi Competitions.*—For the best block of transplanted pure line seed padi (autumn crop) from Vreed-en-Hoop to Hague, the area cultivated to be not less than half an acre in extent. The prizes for this competition were First prize \$15; Second prize \$10; Third prize \$5.

The padi blocks were judged on the following points:—

Preparation and seeding of nursery	...	...	25
Cultural operations in the field	...	...	20
Uniformity of type	...	...	15
Control of insect pests and diseases	...	...	10
Yield	...	...	20
Hand threshing	...	...	10

23. Owing to the lateness of planting occasioned by the long spell of dry weather experienced during the early months of the autumn season, the closing date for receiving entries was extended. Entries were received for the following varieties of padi—Demerara Creole, No. 79 and Blue Stick. One hundred and thirty-nine competitors entered for these competitions; this was a decided improvement on the previous year.

24. The following were the prize-winners:—

1st Prize	...	(\$15)—Hardew, Vreed-en-Hoop.
2nd „	...	(\$10)—Kowsil, Blankenburg
3rd „	...	(\$ 5)—Boodoo, Hague.

It was a notable feature that the nurseries of all the entrants were properly prepared before sowing and presented an attractive appearance of healthy seedlings free from attacks of insect pests.

Flood Relief Measures.

25. A good deal of extra work was entailed in connection with the re-establishment of areas destroyed by the floods. In addition to special competitions, referred to elsewhere, free distributions of planting material, purchased from Flood Relief Funds, were made as shown in the following table.

Quantity Distributed.

	West Demerara	East Bank.
Black Eye Peas—bags (90 lb.)	... 50	...
Eddoes—bags—(180 lb.)	... 7	...
Tannias—bags (180 lb.)	... 42	...
Tannia Bottoms—bags (180 lb.)	... 12	...
Yams—bags (180 lb.)	... 4	...
Sweet Cassava—bundles	... 30	19
Bitter Cassava—bundles	...	6

District Agricultural Committees.

26. The District Agricultural Committee for West Demerara was formed in 1933. The object of the Committee is "to act as an advisory body to the Department, controlling district agricultural activities generally in close collaboration with the Agricultural Officers and the Commissioner of the District." The Committee functioned usefully, making valuable recommendations on a wide range of subjects such as flood relief, rehabilitation methods, exhibitions and competitions, threshing machines, the building up of an export trade in plantains and bananas, etc. The Committee consists of the following members: Director of Agriculture, (Chairman), District Commissioner, District Agricultural Superintendent, (Secretary), Hon. J. B. Singh, Messrs. A. Murison, R. B. Hunter, R. P. Carryl, J. C. Da Silva, W. Ramdeholl, J. W. Jackson and A. Rayman.

Co-operative Credit Banks.

27. From January to July, Mr. H. D. Huggins, M.Sc., performed the duties of Chairman of the six co-operative credit banks of the district. From August Mr. A. A. Abraham relieved Mr. Huggins of part of these duties and assumed Chairmanship of the Good Intent-Sisters, the Den Amstel-Fellowship and the Leguan Credit Banks. These banks continued to serve a useful purpose and there was a considerable demand for loans particularly in those areas where the floods had been most destructive. One of the many features of the work continues to be the maintenance of a vigorous policy in connection with the collection of loans.

A. A. ABRAHAM,
Agricultural Superintendent.

May 15, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE ESSEQUIBO DIVISION FOR THE YEAR 1934.

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REPORT OF THE ESSEQUIBO DIVISION FOR THE YEAR 1934.

GENERAL.

The Assistant Superintendent, Mr. A. A. Abraham left for the West Coast, Demerara, in March to assume the duties of Assistant Superintendent in that District. The Agricultural Superintendent accompanied the League of Nations Commission to the Rupununi in October. During his absence Mr. E. G. Benson from the Rice Grading Office, Georgetown, assumed the duties of Assistant Superintendent and Acting Superintendent.

2. Owing to the floods in January, which resulted in the total loss of the spring crop, the general economic condition of the district has been poor. The floods, together with the lack of money and low prices, have resulted in a decrease of acreage under cultivation, and Government aid in the shape of Flood Relief Grants and loans has been necessary. On account of these unfavourable conditions the high standard of Essequibo padi has not been maintained. The loss of the spring crop, and the resulting panic caused farmers to sow 'lameira'* seed in many areas. Although farmers had good seed padi, after the floods, they tended to sell it or eat it due to lack of money or food.

3. Seed farms were established in the usual manner but on account of the general depression, a high standard of cultivation was not maintained. The method of distributing seed padi for the spring and autumn crops in the district was the same as last year, namely by loans and cash sales. In Wakenaam, however, the system of lending padi for seed purposes was employed. A certain amount of seed padi was distributed free of charge as a flood relief measure.

4. The Co-operative Credit Banks of North and South Essequibo have been granting loans although collections have been poor. The Bank at Sans-Souci, Wakenaam ceased to grant loans at the end of February and confined itself to a policy of collection only, on account of the large amount of outstanding debts. During the year, the island of Leguan was brought into the district.

CROP CONDITIONS.

Padi.

5. A definite set back in the crop conditions of the district has occurred. The flood during the spring crop and the lack of rain during the early stages of the autumn crop have resulted in a reduction of the area planted to rice, of yield and of the quality of padi as well as a general regression of the industry. This, together with the fall in price of rice, and consequently also of padi, has seriously affected the miller and farmer. The latter has reverted to the bull mashing of his padi, since he cannot afford to employ the more desirable, but more expensive, method of hand threshing and a lower quality of rice is the result. Granted favourable weather conditions, it is only after the quality of padi improves by the multiplication of pure seed and the elimination of bull mashing, that the quality of rice produced in the district will again reach its former standard. Migration of labour to the gold and diamond fields and to sugar estates during the growing period of the crop continues to occur as in 1933.

Ground Provisions.

6. After the floods, a special effort was made by the Department to repair the losses in the Pomeroon especially. This was done by the distribution of planting material, by bonuses paid on planted land, and by loans. Government also assisted provision farmers of Anna Regina *annuaries*. Eighty-four acres were selected in

*Seed obtained from a volunteer crop.

the second depth of Anna Regina and a bonus of \$10 per acre given to farmers in order that this new land might be taken in. They were also assisted by the distribution of planting material and the farms are now established satisfactorily.

7. Altogether, the production of ground provisions in the district has been maintained, but unfortunately, the large supply from the planted areas has resulted in a decrease of price towards the end of the year. At the present time the Pomeroon is suffering from over production and inefficient marketing. Since there is a total lack of co-operation, fair price levels cannot be maintained.

DISTRICT WORK.

Rice.

8. Henrietta Experiment Station continued to supply the district and the coastal area particularly with pure line Blue Stick padi. Pure seed farms were established in Wakenaam and Leguan by the Department for the purpose of supplying the islands with seed. There were five acres of Blue Stick in Wakenaam and five acres of No. 79 in Leguan. The crops from the seed farm in Leguan will not be distributed there, however, as it has been decided to maintain the cultivation of Blue Stick padi only in the Essequibo District. As in previous years seed padi has been distributed under two systems, namely, by loans and by cash sales, the former system worked well in Wakenaam. Altogether, 578 bags (140 lb.) of pure line seed from the Department's stocks were distributed during the year, in addition to 2,092 bags distributed from Flood Relief Funds.

9. It is now difficult to get proprietors and farmers to take a genuine interest in the quality of their padi, since they argue that prices are too low to warrant any extra expenditure of labour and capital in this direction. The average miller, moreover, is interested in the quantity, rather than the quality of padi that he buys from farmers during the crop season, and he is not prepared to pay premium prices for very good padi. Having regard to the high standard of Essequibo padi in 1933 this is most regrettable. Attempts are still being made to establish private seed farms throughout the district, but in view of the existing conditions difficulty has been experienced. A permanent block of padi cultivation is desired on each estate for the multiplication of pure line seed supplied from the Henrietta Experiment Station. It should be of sufficient size to supply the estate with its maximum seed requirements, and under the supervision of the District Officers a pure cultivation should be maintained. Padi from this seed farm should be distributed methodically by the proprietors throughout the estate which it supplies and used for seed purposes only.

Flood Relief Measures.

10. *Distribution of Planting Material.*—Funds made available from "Flood Relief" enabled free distributions of planting material to be made in those areas affected by the floods. The following table indicates the quantities so distributed:—

Kind of Material.	Quantity Distributed.
Padi—bags (140 lb.) ...	2,092*
Black Eye Peas—bags (90 lb.) ...	74†
Eddoes—bags (180 lb.) ...	23
Tannias—bags do. ...	12
Tannia Bottoms—bags (180 lb.)...	8
Yams—bags (do.)...	2
Sweet Potatoes—	
(Local)—bags (do.)...	7
(Trinidad)—bags (do.)...	21
Sweet Cassava—bundles ...	25
Bitter Cassava— do. ...	45

*Includes 638 bags purchased for District Commissioner.

†Includes 10 bags sent to North West District.

11. *Pomeroon Agricultural Loans*.—To relieve the severe agricultural condition in the Pomeroon following the destruction of crops during the flood, Government granted relief loans to the extent of \$4,000. Loans were granted under two heads:—(a) A long term, for re-establishing or extending coffee cultivations repayable in 5 years with interest at 6 per cent. per annum. (b) A short term loan for replanting or extending provision cultivation, repayable in 12 months (at reaping time) with interest at 6 per cent. per annum.

Only two loans were applied for, under class (b).

Rice Grading.

12. The method of sampling rice on the Essequibo Coast is as follows:—A sample is taken by the Agricultural Superintendent or his representative from each consignment of rice before it is loaded into the punt for direct export in Georgetown. The sample is put under Government seal and handed to the exporter who delivers it to the Grading Officer, Georgetown. The Grading Officer then has the option of re-examining the consignment in the punt before he issues a certificate. Under the rice grading regulation of 1934, it is necessary for each consignment of rice to obtain the grades specified in the contract under which it is exported. Since this legislation has been enacted, the Agricultural Superintendent has indicated to the exporter the correct grade of his rice by the examination of a duplicate sample. The exporter then knows whether his consignment might be exported before he loads it into the punt; delay and expense are thereby avoided. The system has worked well up to the present.

Unemployment Relief Loans.

13. A loan of \$2,710 were granted by the Government to proprietors of estates for unemployment relief in 1933. This money was loaned to farmers by the proprietors. By the end of 1934, it should have been repaid to Government but this has not been done and \$1,941.18 still remains outstanding. Under the present condition the farmers and proprietors find difficulty in meeting their liabilities.

Competitions.

14. The following competitions were held in the Essequibo District during 1934:—

- (1) For the best block of transplanted pure line seed padi (autumn crop), the area to be not less than half an acre on the Essequibo Coast and in Wakenaam and Leguan Islands.
- (2) For the best miscellaneous farm, the area to be not less than half an acre in extent in the Pomeroon District.
- (3) For the best block of onions grown from seed obtained from the Department of Agriculture the area to be not less than 5 square rods in Wakenaam Island and on the Essequibo Coast.

15. The onion competitions had to be abandoned on account of the floods. A fair number of entries were received for the padi competitions and were up to usual standard. Very few entries were received for the miscellaneous farms in the Pomeroon but the standard of cultivation was fair.

16. The results of the competitions were as follows:—

	ESSEQUIBO COAST.	WAKENAAM.	LEGUAN.	POMEROON.
1st prize \$15...	Ramtikha, Hampton Court...	Juman, Marionville ...	Etwaria, Enterprise ...	J. F. Martins, Martindale.
2nd " 10...	Baran, Aurora ...	Sultan, Good Success ...	Mangroo, Enterprise ...	M. J. Gouveia, Marion Delight.
2rd " 5...	Ramnarine Pundit, Aurora...	Ramscoomer, Zeelandia...	A. Rankin, Claremont ...	S. N. Mentore, Cullen.

School Gardens.

17. The two school gardens at Sans-Souci, Wakenaam and St. John's School, Suddie, are still continued. The former is quite satisfactory, but much improvement is needed at Suddie. Regular visits were made by the Agricultural Officers and improvements are being effected under their supervision.

Anna Regina Estates.

18. The four Government estates of Anna Regina, Henrietta, Richmond and La Belle Alliance were leased to Mr. Ramparikhian Rai for three years as from January 1, 1934. The Bush Lot Land Settlement remains under Government control. The flooding of the spring crop and the lack of water for planting the autumn crop, due to a breach in the Tapacooma Lake, caused a reduction of the acreage under cultivation. Moreover, the poor economic condition of the coast has been responsible for the migration of tenants to sugar estates and the gold fields. The settlers at Bush Lot continued to suffer from malaria but on the whole, their health has not been worse than the tenants of the surrounding estates. The settlers suffered with the rest of the coast during the bad season and at the end of the year their indebtedness to Government amounted to \$2,163.19.

Rice Machinery Tests.

19. A series of rice milling trials were made. Certain adjustments are necessary to the model rice mill to enable it to mill brown rice, but a satisfactory sample of white rice was obtained. These adjustments will be made during the coming year. The winnowing machine gave very satisfactory results.

HENRIETTA EXPERIMENT STATION.

Padi Experiments.

20. The results of the Henrietta variety trial reaped in November, 1934, are shown below. The experiment was laid down in the form of two 6 x 6 Latin squares, but one square was not statistically valid and is excluded from the results :—

MEAN YIELDS OF PADI.

Variety.	Lb. per plot.	Lb. per acre.	Bags per acre.
No. 79 ...	45.18	3,614	25.8
Blue Stick ...	44.00	3,520	25.1
Lead Rice ...	32.00	3,360	24.0
Kalyanan ...	41.68	3,334	23.8
Ramcajara ...	40.83	3,266	23.3
Dem rara Creole ...	39.33	3,146	22.5
Significant Difference ($P=0.05$) ...	4.088	323	...

21. Owing to the fact that only one square was valid, the standard error of the varietal means is higher than usual and, therefore, the difference in yield required for significance is rather high. Accordingly, the differences in yield between the first four varieties are not significant and the only information given by this trial is that (a) No. 79 is significantly better than Ramcajara and Demerara Creole, and that (b) Blue Stick is significantly better than Demerara Creole.

Fruit.

22. *Bananas*.—A small strip of approximately 0.8 acres of Oronoque (Gros Michel) bananas was established at Henrietta. A block of experimental banana cultivation, of approximately five acres of the same variety, was planted on the sand reef at Anna Regina Block "A" in September, 1934. The cultivation is sown with black eye peas at the present time.

23. *Oranges*.—The following varieties of orange trees were also planted on the station :—Valencia 6 ; Satsuma 6 ; Haags Bosch 6 and Sinaas Apples 6.

24. It is a pleasure to record the loyal co-operation of the staff during the year.

E. G. BENSON,
Assistant Agricultural Superintendent,
Essequibo.

March 15, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE NORTH WEST DISTRICT FOR THE YEAR 1934.

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REPORT OF THE NORTH WEST DISTRICT FOR THE YEAR 1934.

GENERAL.

Visits were paid to all the farms in the district. The total mileage travelled by boat was 4,305. The floods which caused so much damage on the eastern part of the coast did not affect this district.

The Agricultural Superintendent, Captain E. Beckett, F.L.S., died in the Public Hospital, Georgetown, on February 24, 1934.

CROP CONDITIONS.

Coffee.

There has been a decrease of 38 acres in the acreage under coffee. One farm of 35 acres in the Kaituma and one of 50 acres in the Aruka District have been so neglected that they cannot now be classed as coffee cultivations. Small farmers who have taken in new lands for ground provisions have planted coffee, but owners with large areas have reduced their acreage owing to the limited supply of labour in the district. Labour obtained from the coast after the floods early in the year proved unsuited for the picking of coffee. The crops on the majority of farms in the Aruka, Koriabo and Waini districts were good but those in the Barima were very poor. The price obtained for coffee during the year varied from \$5.50 to \$5.75 per 100 lb.

Citrus.

The budded plants supplied to farmers in the district are making satisfactory growth and one farmer in the Koriabo has shipped a small quantity of grapefruit to the Georgetown market. The prices obtained, however, were not encouraging.

4. *Limes*.—The lime factory at Mabaruma turned out 30,000 gallons of raw lime juice and 160 gallons of oil of limes but the market for this product is an uncertain one. Shortage of labour proved a handicap here also. The farmers who took seedlings from the station during 1931 have already started to neglect this cultivation owing to the low prices offered for limes by the factory, but Mr. Samson is extending his cultivation and has placed a further order for 1,000 budded plants

Cacao.

5. This crop offers a remunerative price now and is, therefore, being extended. Keen interest is being taken by farmers and older cultivations have been renovated, whilst great care has been shown with the recently planted areas.

Ground Provisions.

6. Farmers responded well to the appeal to extend their areas with ground provisions to meet the shortage caused through the floods in other parts of the Colony. Through the efforts and co-operation of the Department large areas were put under cultivation and the acreage showed an increase of 286 acres.

HOSORORO EXPERIMENT STATION.

Coffee.

7. The following varieties are at present growing on the pegasse soil at the Station: Liberian, Excelsa, Stenophylla, Robusta, De Weveri and Canephora, but have made poor growth.

8. The following is a summary of each variety being grown:

Beds 6, 7, 8 and 9.—Liberian.—Two beds are to be kept pruned and topped and the others allowed to grow as is being done by farmers. The plants have not reached the height for topping. The yields were as follows:—Beds 6 and 7 (un-

topped)—one barrel of ripe berries ; beds 8 and 9 (topped)— $2\frac{3}{4}$ barrels ripe berries. All the plants in these beds have made very unsatisfactory growth.

Bed 21.—Stenophylla.—A few plants of this variety have made some progress but the majority were very backward.

Bed 22.—DeWeveri and Canephora.—The former have made fair growth but the latter were unsatisfactory as the plants are situated in a portion of the bed which is supposed to be poor pegasse soil.

Beds 23 and 24.—Excelsa.—The growth of these plants has been unsatisfactory—a small crop will be reaped during 1935.

Beds 25 and 26.—Robusta.—This variety is the most backward of the whole lot. Eighty-four plants are being cultivated and of this number only twenty-six can be considered as fair. A small crop will be collected during 1935.

Bed 27.—DeWeveri.—There are 71 plants in this bed. One barrel of berries was collected.

Citrus.

9. The area under budded citrus was well maintained and additional varieties were added to the collection during the year. The total number of plants of each class under cultivation on the laterite hill lands of the Station (exclusive of citrus nurseries) is as follows :

Budded Grape fruit (including Marsh, Walters, Duncan and Foster)...	...	...	312
Budded Shaddock	...	...	2
Budded Citrus (U.S. Department of Agriculture)	...	...	10
Budded Lemons	...	...	9
Budded Limes	...	...	168
Hybrid Limes (Dominica)	...	...	2
W.I. Smooth Skinned Lime (St. Lucia)	...	...	24
Seedling Limes	...	...	168
Succadee (Citron)	...	...	1

One hundred and twenty-six grapefruit and fifty-seven orange plants fruited during the year and on the whole produced fruit of only fair quality. The plants of Dancy Tangerine yielded well but the fruits were very small. Four hundred grapefruit were shipped to the Pineapple Canning Company for the canning trials whilst fortnightly shipments were made to Head Office for observations on, and disposal of, the fruit. The crop will run on till April 1935.

10. *Budded and Seedling Limes.*—This area was satisfactorily maintained during the year and the crop was a fair one. The experimental area of $2\frac{1}{2}$ acres budded and $2\frac{1}{2}$ acres seedlings continued to make good progress. The budded plants yielded $202\frac{1}{6}$ barrels and the seedlings $56\frac{1}{3}$ barrels. The old cultivation, which is densely shaded with *Hevea brasiliensis* and Balata, gave a yield of 19 barrels.

11. *Propagation Work.*—A new site was selected for raising stocks of sour oranges, and at the end of the year 3,000 seedlings were growing in nursery beds, of this number 1,000 are ready for budding. Budwood will be taken from selected trees at the Station.

12. *Other Fruit.*—The area under budded and grafted pears was maintained during the year and three plants—two Galvana and one Nimlioh—were added to the collection. The yields from all trees were poor. An analysis of the yields of individual pear plants will be found in the following table.

ANALYSIS OF YIELDS OF INDIVIDUAL PEAR PLANTS OF 6½ YEARS PLANTING,

Variety.				No. of Row and of Trees in Row.	No. of Fruits.	Date of Picking.
St. Anne's	...	...	...	1 2	13	September, 1934.
Rivers	...	...	...	1 3	2	August, 1934.
Trapp	...	...	...	1 4	13	October, 1934.
St. Clair	...	...	...	1 5	5	September, 1934.
Do.	...	...	...	1 6	18	do.
Do.	...	...	...	1 7	5	do.
Do.	...	...	...	1 8	1	October, 1934.
Pollock	...	...	...	1 9	20	September, 1934.
Do.	...	...	...	1 10	33	do.
Do.	...	...	...	1 11	11	do.
Martin Sperry	...	...	...	2 1	15	October, 1934.
R. C. Lord	...	...	...	2 2	1	do.
Rudder	...	...	...	2 3	15	September, 1934.
Do.	...	...	...	2 6	16	do.
Do.	...	...	...	2 7	20	do.
R. C. Lord	...	...	...	3 2	43	October, 1934.
Do.	...	...	...	3 5	50	do.
Munis	...	...	...	4 1	15	do.
Do.	...	...	...	4 3	11	September, 1934.
Do.	...	...	...	4 4	40	October, 1934.
Do.	...	...	...	4 5	77	do.
Do.	...	...	...	4 6	21	do.

Miscellaneous.

13. *Poison Plants*.—No cultivation was carried out on this area during the year, the plants being allowed to grow wild.

14. *B.H. Mahogany*.—These plants have made satisfactory growth, but were attacked by beetles and nine plants were killed during the year. The pest was investigated by the Entomologist and is dealt with in his report.

15. *Piper nigrum*.—Nine of the black pepper plants have made fair growth during the year, and four of these are fruiting. This area will be extended during 1935.

16. *Hydnocarpus anthelmintia*.—The three plants have made fair progress, but the growth of the *Hydnocarpus venenata* was very poor, only seven plants are at present growing.

17. *Neem*.—The one neem plant (*Azadirachta indica*) is making fair growth.

18. The "Historical Cacao" have made fair growth and some of the plants have started to produce a few pods.

19. *Tung Oil*.—The three Tung Oil plants, *Aleurites montana*, planted on June 14, 1934, have made fair growth.

20. *Cover Crops*.—The legume, *Calapogonium muconoides*, is at present growing in patches in the citrus cultivation, and will prove a useful cover as it becomes established.

21. *Ginger*.—Three varieties are under trial, namely, Jamaica, Dominica and Canton. The Dominica variety planted on October 23 in the pegasse soil at Mab-aruma is making fair progress. The Jamaica and Canton varieties were reaped in December. These will be extended on the pegasse and laterite soils in order to compare growth and yields.

22. *Yams*.—Five mounds of Chinese yams were reaped but the yield was only 11 lb. The few tubers of Barbados yams planted yielded 35 lb. These two varieties were extended for further trials.

23. *Oil Palms*.—These plants have made very good growth on the pegasse soil during the year.

24. *Citronella*.—The citronella grass has made favourable growth and the area was extended to 2½ acres during the year.

WAUNA SUB-STATION.

25. This station was maintained during the year. The coconuts obtained from Essequibo have made good growth, as also the six plants from the Moruca District. The remaining thirteen plants of the Dwarf variety from St. Lucia have not made satisfactory growth—an application of fertilizers has been given to these plants.

Citrus.

26. The majority of the grapefruit and orange plants have not made satisfactory growth. Three Marsh grapefruit and five orange plants, including Dancy Tangerine, have produced a few poor fruits. The budded limes have made fair growth during the year and twenty-seven plants fruited.

Miscellaneous.

27. The Black and White Haiari planted in the open continue to make satisfactory growth. The African Oil Palms planted during June 1932 have made very good growth. The mesquite plants have failed to make progress; these plants cannot stand the heat on the Wauna sands.

DISTRICT WORK.

Competitions.

28. The following agricultural competitions took place in the district during the year :—

(1) For intensive and immediate cultivation of ground provision crops with a minimum increase of 25 per cent. above the area planted by individual farmers (based on the census returns) and for the general maintenance in good order of their present areas in ground provision crops, in the undermentioned districts :—

BARIMA-IMBOTERO DISTRICT.

(To include Arukamai, Waini, Moruka and Arakaka Districts).

1st prize—\$50 ; 2nd prize—\$40 ; 3rd prize—\$35.

KORIABO-ARUKA DISTRICT.

(To include Kaituma, Madadowa Hills, Hosororo District and Mabaruma).

1st prize—\$50 ; 2nd prize—\$40 ; 3rd prize—\$35.

(2) For immediate increased cultivation of ground provisions below 25 per cent. increase according to census returns, and for the general maintenance in good order of present holdings, in the undermentioned districts :—

BARIMA-IMBOTERO DISTRICT.

(To include Kaituma, Waini, Moruka and Arakaka Districts).

15 prizes at \$10 each.

ARUKA-KORIABO DISTRICT.

(To include Arukamai, Madadowa Hills, Hosororo and Mabaruma Districts).

20 prizes at \$10 each.

29. The conditions and awards governing the competitions were entirely dependent on :—

Keeness displayed by farmers throughout the competition.
That the conditions of competitions have been fully observed.
Reports submitted to the Department by the judges.

30. The competitions in both districts were divided into two classes—Class A covering a 25 per cent. increase above the area planted by individual farmers, and Class B for the immediate increased cultivation of ground provisions below a 25 per

cent. increased. In the Barima-Imbotero District six entries were received in Class A and twelve in Class B, whilst in the Aruka-Koriabo six entries were received in Class A and forty-three in Class B, making a total of sixty-seven entries in both districts. Preliminary judging was carried out in July and final judging on August 28 and 29. The judges were: The District Commissioner, Agricultural Instructor, Messrs. E. Chan-a-Sue and C. T. Broomes.

31. The points on which the competition were judged were as follows:—

Drainage	...	...	...	50
Cultivation	...	...	...	25
Control of weeds	...	...	...	15
Keeness	...	...	...	10

The following final awards were made:—

Class A.

BARIMA—IMBOTERO DISTRICT.

H. Chanderbhand	...	1st prize	...	\$50
C. Taylor	..	2nd „	...	40
C. Poon	...	3rd „	...	35

ARUKA—KORIABO DISTRICT.

J. Bisnauth	...	1st prize	...	\$50
Mazaralli	...	2nd „	...	40
R. Walker	...	3rd „	...	35

Class B.

BARIMA—IMBOTERO DISTRICT.

F. Ramit	...	...	\$10
A. Fraser	...	...	10

ARUKA—KORIABO DISTRICT.

W. Solomon	..	...	\$10
H. J. Samson	...	...	10
O. Hercules	...	...	10
W. N. Gill	...	...	10
P. D'Silva	...	...	10
R. Walker	...	...	10
Chamila	...	...	10
T. Phang	...	...	10
C. Pierre	...	...	10
E. Baptiste	...	...	10
Maturi	...	...	10

It was not found possible to make all the awards in this class as 44 entries had to be eliminated at the preliminary judging in both districts as they were not up to the required standard. The judges made special mention of the farms in the free survey block in the Aruka River. These farmers have done exceptionally good work, when it is taken into consideration that no outside assistance has been given and, in many instances, too, they have had to work on other farms to earn sufficient money to enable them to cultivate their own holdings. In the Barima District no new lands were taken up last year and farmers had, in consequence, no land for provision crops.

33. In addition a competition was run for the best cultivation of not less than two acres in extent on the hill lands. The cultivations were judged on the following points:—

Produce grown and general rotation	...	...	20
Precautions against soil erosion and wash	...	...	20
Control of weeds, pests and diseases	...	...	20
Livestock	...	...	20
Permanent plants cultivated	...	...	20

The prizes awarded were as follows:—

A. Miller ...1st prize, \$10; R. Alfred ...2nd prize, \$5.

Pests and Diseases.

34. *Sclerotium coffeicolum* (Stahel).—This disease was very severe in some grants in the Barima, Aruka and Koriabo Districts, whilst in others it was little in evidence. Control measures were again carried out including the burning of diseased materials in the districts where it occurred.

35. *Wilt Disease*.—This was again noticeable during the year throughout the district but to a very small extent.

36. *Cockles (Hardback Beetles)*.—Some damage was done by this pest in certain areas in the Koriabo and Aruka Districts. It is interesting to note that the Imbotero District was not touched by this pest.

37. *Coushi Ants*.—This proved very troublesome and considerable damage was done to young crops on the Hill Lands. Assistance was given by supplying small quantities of carbon bisulphide to farmers who cannot afford to purchase this insecticide.

DISTRIBUTION OF SEEDS AND PLANTS.

The following plants, seeds and cuttings were distributed during the year:—

Budded Grapefruit (Marsh, Duncan and Foster)...	114	plants*
Budded Oranges	176	" †
Budded Limes	526	" ‡
Seedling Limes	236	
Cacao Seedlings	1,517	
Sweet Potato (cuttings)	2,500	
Sweet Potato (tubers)	10½	lb.
Tobacco Seeds	6½	oz.
Ginger	2	lb.
Pineapples suckers	589	
Krowa suckers	25	

39. The visitors to the stations included: The Deputy Director of Agriculture, the Government Botanist, the Entomologist, Dr. W. A. Archer, the District Commissioner, the Assistant Colonial Secretary and the Principal of the Carnegie Institute.

L. E. McKINNON,
Agricultural Instructor.

April 14, 1935.

*Exclusive of 188 plants sent to Government Botanist for distribution to various districts.

†Exclusive of 12 plants sent to Government Botanist for distribution to various districts.

‡Includes 100 budded limes sent to Superintendent, East Demerara.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE PLANT BREEDER FOR THE YEAR 1934.

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REPORT OF THE PLANT BREEDER FOR THE YEAR 1934.

GENERAL

1. Two weeks' casual leave was taken from July 12 to July 25 inclusive.
2. Visits were paid to Essequibo and Berbice Districts in connection with the laying down of padi experiments.

Padi Grown during 1934.

A record of the padi grown on the Central Rice Experiment Station, Georgetown, is shown in Table I. below:—

TABLE I.
PADI GROWN ON THE CENTRAL RICE STATION DURING 1934.

Variety.	Spring Crop lb.	Autumn Crop lb.	Total lb.
No. 79	24,610	36,059	60,669
Demerara Creole	6,510	5,822	12,332
H 7	...	915	915
Blue Stick	...	996	996
Kalyaman	...	724	724
Ramcajara	...	890	890
White Pin	...	258	258
No. 75	...	582	582
No. 78	...	614	614
H 6	...	440	440
D 111	...	574	574
D 114	...	614	614
Lead Rice	...	664	664
McKenzie Small	...	580	580
Hybrids and Progeny Rows	...	2,742	2,742
Total	31,120	52,474	83,594

4. The greater part of this padi was handed over to the Agricultural Superintendent, East Demerara, for storage and distribution. The remainder was reserved for planting up the district pure line blocks and establishing private seed farms throughout the Colony.

PADI EXPERIMENTS.

Yield Trials.

5. Three variety trials were conducted on the Experiment Station, Georgetown, and one on Henrietta Experiment Station, Essequibo. The results of the three Georgetown trials are given below in Tables II, III and IV.

6. *Variety Trial No. 1.*—In this trial, six varieties were laid down in two 6 x 6 Latin Squares. The mean yields observed are set out in the following table:—

TABLE II.
RESULTS OF VARIETY TRIAL NO. 1.

Variety.	Padi lb. per acre.	Percentage of Mean.
Blue Stick	3,332	110.0
No. 79	3,287	108.6
H 7	3,103	102.5
Ramcajara	2,992	98.9
Demerara Creole	2,885	95.3
Kalyaman	2,562	84.6
Significant Difference ($P=0.05$)	198	6.54

7. It will be seen that the variety *Blue Stick* headed the list, and was significantly better than all varieties except *No. 79*.

8. *No. 79* was significantly better than *Ramcajara*, *Demerara Creole* and *Kalyaman*.

9. The recent successes of *Blue Stick* in the Demerara trials are significant not only in the statistical sense. In the 1930, 1931 and 1932 trials at Georgetown, *Blue Stick* failed to impress, largely owing to its susceptibility to a leaf-spot disease. In 1932, fresh seed was obtained from Essequibo and an immune strain was isolated, resulting in the marked improvement in yield since recorded.

10. *Variety Trial No. 2.*—In this trial, eight varieties, including two short grained ("barley") types and two recent selections, *D 111* and *D 114*, were laid down in an 8 x 8 Latin Square. The mean yields recorded are shown below in Table III.

TABLE III.
RESULTS OF VARIETY TRIAL NO. 2.

Variety.	Padi lb. per acre.	Percentage of Mean.
Lead Rice	3,373	121.5
D 114	3,295	118.7
McKenzie Small	2,905	104.7
D 111	2,807	101.2
No. 78	2,707	97.5
No. 75	2,429	87.2
H 6	2,410	86.9
No. 79	2,282	82.2
Significant Difference (P=0.05)	296	10.7

11. This trial was marked by the unaccountable failure of the standard, *No. 79*. There was no significant difference between the leading varieties, *Lead Rice* and *D 114*, but these two gave significantly higher yields than all other varieties.

12. The long grained varieties were again inferior in yielding power to the medium and short grained varieties. The grain characters of *Lead Rice* and *McKenzie Small*, however, preclude them from further extension, as there is little demand for the barley type of rice. There is a small local demand for this type of padi for feeding chickens, and barley padi always fetches two or three cents more per gallon than the longer grained types.

13. The success of *D 114* is worthy of note as this variety approaches very closely to the Carolina type of grain and may be of value in approaching markets hitherto untapped.

14. *Variety Trial No. 3.*—In this trial, two selected strains of *No. 79* and one of *Demerara Creole* were tested against the commercial seed of these two varieties. The experiment was laid out in a 5 x 5 Latin square and the results obtained appear in Table IV. below:—

TABLE IV.
RESULTS OF VARIETY TRIAL No. 3.

Strain.	Description.	PADI. lb. per acre.	Percentage of Mean.
No. 79 No. 1	Plot No. 2 in 1933 Progeny Rows	3,284	105.3
No. 79 No. 2	Plot No. 6 in 1933 Progeny Rows	3,400	109.0
No. 79 No. 3	Ordinary seed	3,312	106.2
D.C. No. 1	Plot No. 3 in 1933 Progeny Rows	2,928	93.8
D.C. No. 2	Ordinary seed	2,676	85.8
Significant Difference (P=0.05)		353	11.3

15. There were no significant differences between the three strains of *No. 79*, but they were all definitely superior to *Demerara Creole* in yield. The selected strain of *Demerara Creole* gave 1.8 bags more than the ordinary seed, but this difference was not significant.

Milling Tests.

16. A milling test was carried out with a bag (140 lb.) of each variety of padi. Each variety was subjected to a uniform parboiling process of 42 hours in the soaking tanks and 15 minutes steaming at 20 lb. pressure. The padi was then

dried in the sun for 20 hours and milled in an Engelberg huller. The varietal differences in grain size necessitated frequent adjustments of the huller, which no doubt increased the breakage in some cases.

17. The rice was submitted to the usual commercial analyses for breakage and discoloration by the Rice Grading Office. The percentage of discoloured grains in the samples submitted was very low and may be attributed to damage by birds and padi bugs. The figures given below in Table V. for percentage of broken and discoloured grains are, therefore, made up almost entirely of broken grains.

18. Table V. also shows the length and breadth of the husked grain of each variety, obtained by measuring, in each case, 100 grains husked by hand. The colour of the rice is obtained by comparison with standard samples, while the grade is awarded according to standards fixed locally by the Rice Grading regulations. A variety of the Carolina type, namely, *White Pin*, was included in the milling trial for comparison with *D 114*.

TABLE V.
PADI MILLING TEST, 1934.

Variety.	Dimensions of Grains without the husk.				Rice from 100 lb. padi. lb.	Broken and discoloured grains. per cent.	Colour.	Grade Awarded.
	Length mm.	Width mm.						
Kalyaman ...	7.63	.032	2.18	.006	66.4	22.0	Super	Extra No. 1.
Demerara Creole ...	7.60	.020	2.18	.005	66.9	18.8	Super	Extra No. 1.
H 7 ...	7.58	.020	2.10	.005	69.3	28.4	Super	*
No. 75 ...	7.57	.020	2.06	.007	66.0	19.3	Super	Extra No. 1.
H 6 ...	7.40	.021	2.11	.006	67.9	29.5	No. 1	*
D 114 ...	7.16	.018	2.57	.006	69.3	14.7	Super	Extra No. 1.
White Pin ...	7.09	.020	2.51	.005	67.4	17.6	Super	Extra No. 1.
Blue Stick ...	6.58	.016	2.20	.005	67.2	7.1	Super	Super.
No. 79 ...	6.57	.011	2.16	.005	66.2	5.7	Super	Super.
D 111 ...	6.56	.018	2.20	.007	69.5	4.3	Super	Whole Grain Super.
Ramajara ...	6.52	.013	2.37	.005	69.0	11.1	Super	Super.
No. 78 ...	6.52	.016	2.17	.005	68.8	7.6	Super	Super.
Lead Rice ...	5.83	.014	2.60	.006	78.8	5.2	Super	Super.
McKenzie Small ...	5.48	.016	2.11	.006	68.1	3.9	No. 1	*

* There are no commercial grades applicable to these combinations of colour and breakage.

The long grained varieties, being more susceptible to breakage in a huller of this type, failed to make super rice. The excessive breakage shown by *H 6* and *H 7* is due to the fact that these varieties possess a slightly curved grain.

Influence of Date of Sowing on Growth Period.

19. It is a well known fact that the date of sowing greatly influences the duration of the rice crop, but the magnitude of the variation is not realised. In order to determine the extent of the variation in growth period, a sowing was made on the first day of each month with the two varieties *No. 79* and *Demerara Creole*. The number of days from sowing to flowering was taken as a measure of the growth period and the results obtained are set out below in Table VI.

TABLE VI.
EFFECT OF DATE OF SOWING ON THE GROWTH PERIODS OF THE VARIETIES NO. 79 AND DEMERARA CREOLE.

Date of Sowing.	No. of days from Sowing to Flowering.	
	No. 79.	Demerara Creole.
January 1 ...	120	113
February 1 ...	106	89
March 1 ...	153	147
April 1 ...	140	140
May 1 ...	133	133
June 1 ...	114	114
July 1 ...	99	96
August 1 ...	98	96
September 1 ...	93	95
October 1 ...	101	96
November 1 ...	94	97
December 1 ...	100	96

Manurial Trials.

20. *Response to Sulphate of Ammonia.*—In this experiment, dressings of 3 cwt. and 6 cwt. of sulphate of ammonia were applied to the variety No. 79. The experiment was laid down in three 3 x 3 Latin Squares and the yields observed are shown below in Table VII.

TABLE VII.
RESPONSE OF No. 79 TO DRESSINGS OF 3 CWT. AND 6 CWT. OF SULPHATE OF AMMONIA.

Treatment.	Padi. lb. per acre.	Percentage of Mean.	Increase over Control. lb. per acre.	Cost of Fertiliser.
Control—no manure ...	1,752	69.3	...	...
3 cwt. S/A per acre ...	2,568	101.6	816	\$ 6 75
6 cwt. S/A per acre ...	3,256	128.3	1,504	13 50
Significant Difference ($P=0.05$) ...	403	15.9	...	...

21. The mean yield given by the control plots is low and the increases obtained by fertilising highly significant. If the price of padi is taken at \$1.00 per bag, it will be seen that the increases in yield, although large, do not pay for the cost of the fertilisers.

22. *Application of fertilisers at different stages of growth.*—In all previous experiments conducted at the Experiment Station, artificial fertilisers have been applied two or three days after transplanting. In view of recent work on the absorption of nutrients by the rice plant, it was thought that fertilisers might be more beneficial if applied at a later stage.

23. A mixed fertiliser at the rate of 2 cwt. Sulphate of Ammonia, 2 cwt. Superphosphate and 2 cwt. Sulphate of Potash was applied at the following growth stages :—

- (a) at transplanting.
- (b) 40 days after transplanting.
- (c) at flowering.
- (d) at transplanting and again at flowering (*i.e.* a double dressing).

24. The plots which received fertiliser at flowering time ripened unevenly owing to excessive tillering. The mean yields recorded are shown below in Table VIII.

TABLE VIII.
APPLICATION OF FERTILISERS AT DIFFERENT STAGES OF GROWTH OF THE RICE CROP.

Time of Application.	Padi. lb. per acre.	Percentage of Mean.	Increase over Control. lb. per acre.
Control—no fertiliser ...	2,280	70.5	...
At transplanting ...	3,184	98.5	904
40 days after transplanting ...	3,720	115.1	1,440
At flowering ...	2,840	87.9	560
At transplanting and at flowering ...	4,120	127.5	1,840
Significant Difference ($P=0.05$) ...	461	14.3	...

25. The yield given by the double dressing (at transplanting and at flowering) is the highest, but is not significantly better than the single dressing at 40 days after transplanting. This latter application was significantly better than the single dressing at transplanting or the single dressing at flowering.

26. The increases obtained were not profitable, largely owing to the high cost of the potassic fertiliser, and this experiment is being repeated on a more extensive scale, leaving out the potash. If similar increases could be demonstrated with sulphate of ammonia and superphosphate, their application would be a definitely profitable undertaking.

27. *Residual Manurial Experiments.*—Experiments to determine the residual effects of manures applied in these and previous experiments showed only a slight effect due to superphosphate. The other fertilisers did not affect the following crop. Outstanding yields were given by a few plots which received artificial fertilisers on top of the residual effect of green manure applied the previous crop. This experiment was not randomised, but will be followed by more exacting trials in 1935.

Yield Trials with Graded Seed.

28. Yield trials with *Demerara Creole* seed graded into large, medium and small by a seed-selecting machine have been continued. The objects of these experiments are:—

- (a) to determine if increased yields can be obtained by eliminating the smaller seeds.
- (b) to investigate the possibility of separating the variety eventually into a large seeded and a small seeded strain. This could only happen if the variety were originally mixed as regards grain length. In these experiments, therefore, the grades were bagged separately after reaping, and a bag of each was graded in the machine. The large seed obtained from the previous large seed and the small seed from the previous small seed were always retained for further trial.

29. Two such trials were reaped during the year, one in April and one in November, with, respectively, the third and fourth “generations” of selected seed. The trial reaped in April gave the following results:—

TABLE IX.
YIELD TRIAL WITH GRADED SEED.

Grade.	Description.	Padi. lb. per acre.	Percentage of Mean.
A 1. No. 1	Large seed from previous large seed ...	2,784	100.0
A 1. No. 2	Medium “ “ “ “ “ ...	2,680	96.3
A 1. No. 3	Small “ “ “ “ “ ...	2,760	99.1
C 3. No. 3	Small seed from previous small seed ...	2,800	100.6
D	Control—unseparated seed from previous control plots ...	2,880	103.4
	Significant Difference ($P=0.05$) ...	269	7.7

There were no significant differences in yield.

30. The trial reaped in November gave similar results as will be seen from Table X below:—

TABLE X.
YIELD TRIAL WITH GRADED SEED.

Grade.	Description.	Padi. lb. per acre.	Percentage of Mean.
A1 No. 1. 1	Large seed from previous large seed ...	2,578	98.5
A1 No. 1. 2	Medium seed from previous large seed ...	2,590	99.0
A1 No. 1. 3	Small seed from previous large seed ...	2,578	98.5
C3 No. 3. 3	Small seed from previous small seed ...	2,634	101.5
D	Control—unseparated seed from previous control plots ...	2,678	102.4
	Significant Difference ($P=0.05$) ...	224	8.6

31. In this experiment also there were no significant differences in yield between the various grades.

32. In order to discover if there was a greater percentage of large grains in the A grades than in the C grade, a bag of each grade was put through the separat-

ing machine. The weights of padi falling into each grade and the percentage separations are shown below in Table XI:—

TABLE XI
COMPOSITION OF THE VARIOUS GRADES OF PADI REAPED NOVEMBER, 1934.

Grade.	Separation.	Weight of Padi falling into each grade, (lb.)	Percentage Separation.
A1 No. 1. 1	Large ...	30	21.9
	Medium ...	80	58.4
	Small ...	27	19.7
	Total ...	137	100
A1 No. 1. 2	Large ...	24	17.5
	Medium ...	73	53.3
	Small ...	40	29.2
	Total ...	137	100
A1 No. A 3	Large ...	27½	19.9
	Medium ...	80	58.0
	Small ...	20½	22.1
	Total ...	138	100
C3 No. 3. 3	Large ...	23	20.2
	Medium ...	84	60.4
	Small ...	27	19.4
	Total ...	139	100
D	Large ...	28	20.3
	Medium ...	88	63.8
	Small ...	22	15.9
	Total ..	138	100

33. Comparing the percentage separations of the five grades under trial, it is obvious that there are no differences of any consequence between the composition of the A grades and the C grade. The only conclusion to be drawn, therefore, from this series of experiments is that the grading of *Demerara Creole* seed by the selecting machine in use at the Experiment Station is of no value either as a means of increasing the yield, or as a means of altering the composition of the variety.

34. In this latter connection, the results obtained in Essequibo by Mr. Seymour are of interest, the variety in this case being *Blue Stick*. After having been graded for several years, it is noticeable that Mr. Seymour's padi is, on the average, distinctly longer than the typical *Blue Stick*. Samples were taken during grading operations and 100 grains of each measured. The mean length and breadth recorded are shown below in Table XII. A typical sample of *Blue Stick* from Henrietta Experiment Station is included for comparison.

TABLE XII.
MEASUREMENTS OF *BLUE STICK* PADI, GRADED AND UNGRADED.

Description.	Length mm.	Coefficient of variation.	Breadth mm.	Coefficient of variation.
Graded (Small) ...	6.54	5.32	2.33	5.67
Graded (Medium) ...	6.68	5.37	2.37	7.50
Graded (Large) ...	6.96	6.35	2.33	5.19
Ungraded (Henrietta) ...	6.38	5.53	2.22	5.19

35. It will be seen that even the small grade exceeds the typical *Blue Stick* in length. The Co-efficient of Variation (*i.e.* the standard deviation expressed as a percentage of the mean) gives a measure of the uniformity of the sample, and it is noticeable that the graded seed compares unfavourably with the Henrietta seed in this respect. This would be expected if there was a slight admixture of other long-grained varieties, as the longer grains would tend to be retained in the large grade of seed and, in fact, a number of grains resembling *Demerara Creole* was observed in the larger grades. The effect of this grading on yield has not yet been determined.

Spacing Experiment with a Carolina Variety.

36. Varieties of the Carolina type have been introduced into the Colony from time to time by private enterprises, and are occasionally met with in the districts under such names as "Berbice Creole," "Berbice Barley," "White Pin" etc. Although the yield is rather poor, the type possesses many desirable features, such as strong straw, early maturity, large panicles and a strong tendency to retain the grain. Its chief disadvantage under local conditions is poor tillering power, and it was thought that a greater yield might be obtained by spacing the plants closer.

37. A small randomised trial was laid down with two spacings, viz. 4 x 4 inches and 6 x 6 inches. Mean yields recorded are shown below in Table XIII.

TABLE XIII.
SPACING EXPERIMENT WITH A CAROLINA VARIETY.

Spacing.	Padi lb. per acre.
4 x 4 inches	2,040
6 x 6 inches	2,200

38. The difference was not significant and it is obvious that closer spacing does not improve the yield of this variety.

Double Transplanting of Padi.

39. This experiment was designed to test the claim recently made by Sengupta* that considerable increases in yield may be obtained by double transplanting. Briefly, the method adopted is as follows:—The seedlings are lifted from the nursery and transplanted in sets of two to four seedlings per set at rather close spacing. About 25 days later, the seedlings are again lifted and transplanted into the field in the normal manner.

40. A more elaborate trial was conducted at the Experiment Station to test the merits of the above process, and also to discover the optimum ages at which the first and second transplantings of the seedlings should be done. Six treatments were decided upon as follows:—

1. Single Transplanting at 4 weeks from date of sowing.
2. Single Transplanting at 5 weeks from date of sowing.
3. Double Transplanting, first at 3 weeks, second 3 weeks later.
4. Double Transplanting, first at 3 weeks, second 4 weeks later.
5. Double Transplanting, first at 4 weeks, second 3 weeks later.
6. Double Transplanting, first at 4 weeks, second 4 weeks later.

41. The experiment was arranged in the form of a 6 x 6 Latin Square, the individual plots being 1/80th of an acre in extent. Seed of the variety No. 79 was sown in the nursery on April 4. Treatments 1 and 2 were planted direct into the experiment in the customary manner on May 22 and 28, i.e., 32 days and 38 days respectively after sowing the seed. In the case of treatments 3 and 4, a bed in an adjacent field was planted at approximately 5 x 5 inch spacing on May 14 (25 days after sowing). These seedlings were lifted on June 5 and 11 to plant treatments 3 and 4 respectively. It was found that each of the sets could be split into three or four lots for the second planting, so that one square rod of the secondary nursery was sufficient to plant six square rods in the field. Treatments 5 and 6 were planted in a similar manner. The dates of the several plantings are summarised below in Table XIV.

* Agriculture and Live Stock in India, 1933; 111: 465-469.

TABLE XIV.

SUMMARY OF DATES OF PLANTING IN THE DOUBLE TRANSPLANTING EXPERIMENT.

Treatment.	Date seed sown in nursery.	Date of first transplanting.	No. of days from date of sowing.	Date of second transplanting.	No. of days from second transplanting.
1	April 21	May 22	32	...	...
2	"	" 28	38	...	...
3	"	" 14	24	June 5	22
4	"	" 14	24	" 11	28
5	"	" 22	32	" 11	20
6	"	" 22	32	" 18	27

42. The mean yields of padi obtained, expressed in lb. per acre, are set out below in Table XV.

TABLE XV.

MEAN YIELDS OF PADI IN THE DOUBLE TRANSPLANTING EXPERIMENT.

Treatment.	Padi. lb. per acre.	Percentage of Mean.
1	3,000	92.0
2	2,990	91.7
3	3,170	97.3
4	3,273	100.4
5	3,523	108.1
6	3,597	110.4
Significant Difference (P=0.05)	365	11.3

43. It will be seen that the double transplanting (Treatments 5 and 6) gave a significantly higher yield than the single transplanting, the increase in yield being approximately four bags per acre. The highest yield was obtained by transplanting first when the seedlings were four weeks old and again four weeks later.

44. Throughout the experiment, Treatments 5 and 6 exhibited the healthiest appearance. It was observed that the second pulling and splitting of the clumps checked excessive tillering, but further investigation is being carried out to determine the exact reasons for the increased yield.

45. Before considering the additional costs incurred by double transplanting, the various operations entailed in cultivating one acre of land by this process are outlined :—

- (1) Sow sufficient seed (approximately 12 lbs.) in the nursery in the customary manner.
- (2) Carry out first transplanting of the $\frac{1}{5}$ th acre 4 weeks after the seed has been sown in the nursery.
- (3) Carry out second transplanting at 8 weeks from date of sowing or 4 weeks after first transplanting.

46. It may be pointed out that whilst the seedlings are developing after the first transplanting, the remaining $\frac{4}{5}$ ths of the acre should be ploughed. The additional costs involved are as follows :—

- (1) Transplanting $\frac{1}{5}$ th of an acre at 5 x 5 inch spacing, approximately \$1.
- (2) Pulling and splitting the clumps. The seedlings could be pulled by one man at a cost of 50 cents while the latter process could be done by the women employed in transplanting.
- (3) Additional hoeing of the $\frac{1}{5}$ th of an acre before it is planted for the second time, say 30 cents.

The total extra cost would be approximately \$1.80, so that an increase of four bags per acre is definitely profitable.

Cover Crops for Padi Fields.

47. In connection with green manuring experiments, efforts are being made to discover a suitable cover crop which can be grown *in situ*, and will, therefore, not only enrich the soil, but will provide a means of checking weed growth.

48. Two species of *Sesbania* have been introduced, namely, *S. speciosa* obtained from East Africa through Kew, and *S. Aegyptiaca* from the Imperial College of Tropical Agriculture, Trinidad. Both species were sown in a rice bed but did not prove very successful owing to their inability to compete with the quick growing sedges in the early stages of growth. It was necessary, in fact, to weed the plots in order to give the seedlings a chance of survival.

49. Trials were also made with *Neptunia oleracea*, a legume with a floating stem which roots at the nodes and which is often abundant in trenches along the Coast. It was found, however, that growth was too slow and that the roots lack nitrogen-fixing bacteria.

50. Very satisfactory results have been obtained with a legume identified as *Vigna repens* found growing wild about the Experiment Station, Georgetown. It is easily established by cuttings and rapidly smothers the weeds. An added advantage is that it will continue growing if conditions are favourable and may, therefore, be used to cover the ground for an indefinite period.

RICE BREEDING.

Pure Line Selection.

51. *Progeny Row Plots*.—The rice collection at the Experiment Station was planted up twice during the year in observation plots. The first sowing was made in November, 1933 and plots were reaped from March to May, 1934. Plots were sown again in June and reaped from October to December. The best plots were reserved for variety trial.

52. During tours of inspection in the districts, the following new varieties were collected :—

TABLE XVI.
NEW VARIETIES COLLECTED LOCALLY DURING 1934.

Date.	District.	No. of Varieties collected.
29. 8.34	Berbice	4
12. 9.34	Do.	11
2.10.34	Do.	1
26.10.34	West Demerara...	1
27.11.34	Essequibo	3
Total	...	20

53. New varieties received from other sources are shown below in Table XVII. :—

TABLE XVII.
VARIETIES IMPORTED DURING 1934.

Date Received.	Country of Origin.	No. of Varieties.	Remarks.
10. 1.34	Assam, India	10	4 discarded.
10. 1.34	Federated Malay States	10	7 discarded.
13. 1.34	Bombay Presidency	5	3 discarded.
3. 2.34	Tanganyika	6	1 discarded.
28. 2.34	Bengal, India	8	2 discarded.
19. 3.34	Central Provinces, India	7	1 discarded.
19. 3.34	United Provinces, India	6	2 discarded.
16. 4.34	Madras, India	6	1 discarded.
16. 4.34	Tanganyika	8	1 failed to germinate.
8. 5.34	Egypt	7	1 failed to germinate, remainder discarded.
17. 5.34	North Borneo	2	
17. 7.34	Siam	2	
30. 8.34	Java	5	
10.11.34	Sind, India	6	
19.11.34	North Borneo	3	

Hybridisation.

54. The seventh generation of hybrid plots from the crosses *Americano 1600* x *Demerara Creole* and *Mexican Edith* x *Demerara Creole* are breeding true to type and the best plots will be reserved for competitive trials against standard varieties during 1935. The sixth generation progeny from the cross *Kristna Kata Kulu* x *No. 79* require further selection before inclusion in variety trials.

Inheritance Studies.

55. *F₃ data on the inheritance of husk colour*—In the 1933 Divisional Reports of the Department of Agriculture, British Guiana, *F₂* data on the inheritance of various husk pigments were presented. From the *F₂* populations of each cross, seed was reserved from 50 plants selected at random, and sown. The results obtained from the *F₃* progenies of some of the crosses are presented below.

56. *Ripening Gold* x *Black Furrows*—This study was made in the cross between *Rupununi* and *Loomee*. The husk colours of the parents and of the *F₁* are summarised below:—

	<i>Rupununi.</i>	<i>Loomee.</i>	<i>F₁</i> <i>Rupununi</i> x <i>Loomee.</i>
Husk Colour:	Ripening Gold.	Straw with Black Furrows.	Straw.

57. Previous studies have shown that the majority of non-anthocyanic husk pigments are recessive to the normal straw colour giving *F₂* ratios of 3 straw : 1 pigmented. In the case cited above, it is apparent that the variety *Loomee* must possess the inhibitor for the "Ripening Gold" character, while *Rupununi* possesses the inhibitor for "Black Furrows". If these two inhibitors are independent, an *F₂* ratio of 9 straw : 3 black furrows : 3 ripening gold : 1 ripening gold with black furrows would be expected. The actual *F₂* segregation observed is shown in Table XVIII.

TABLE XVIII.

SHOWING *F₂* SEGREGATION FOR HUSK COLOUR IN THE CROSS *LOOMEE* x *RUPUNUNI*.

	Straw.	Black Furrows.	Ripening Gold.	Ripening Gold with Black Furrows.
Observed Figures	98	49	47	9
Expected 9: 3: 3: 1	114.3	38	38	12.7
Deviation from expectation	-16.3	+11.0	+ 9.0	-3.7

58. If we assume that *S₁* is the inhibitor for "Ripening Gold" and *S₂* the inhibitor for "Black Furrows," it is possible to predict the *F₃* behaviour on the basis of the above *F₂* ratio of 9: 3: 3: 1, as follows:—

Phenotype.	<i>F₃</i> behaviour.	Genotype.
9 Straw	1 will breed true for straw colour...	<i>S₁ S₁ S₂ S₂</i>
	2 will segregate in the ratio 3 straw: 1 black furrows	<i>S₁ S₁ S₂ s₂</i>
	2 will segregate in the ratio 3 straw: 1 ripening gold	<i>S₁ s₁ S₂ S₂</i>
	4 will segregate in the ratio 9 straw: 3 black furrows: 3 ripening gold: 1 ripening gold with black furrows.	<i>S₁ s₁ S₂ s₂</i>
3 Black Furrows	1 will breed true for black furrows	<i>S₁ S₁ s₂ s₂</i>
	2 will segregate in the ratio 3 black furrows: 1 ripening gold with black furrows.	<i>S₁ s₁ s₂ s₂</i>
3 Ripening Gold	1 will breed true for ripening gold	<i>s₁ s₁ S₂ S₂</i>
	2 will segregate in the ratio 3 ripening gold: 1 ripening gold with black furrows.	<i>s₁ s₁ S₂ s₂</i>
1 Ripening Gold with Black Furrows	Will breed true for ripening gold with black furrows	<i>s₁ s₁ s₂ s₂</i>

59. The 50 F_2 plants selected at random for a study of F_2 behaviour were classified according to husk or colour as follows:—

- 24 straw.
- 13 black furrowed.
- 11 ripening gold.
- 3 ripening gold plus black furrows.

The segregation observed in the F_2 progenies of these plants is summarised below in Table XIX:

TABLE XIX.

SUMMARY OF BEHAVIOUR OF 50 F_2 FAMILIES AS REGARDS HUSK COLOUR IN THE CROSS
LOOMEI x *RUPUNUNI*.

F_2 Phenotype	F_2 Genotype	Expected F_2 Behaviour.	Number of F_2 families.	Segregation.			
				Straw.	Black Furrows.	Ripening Gold.	R. Gold + B. Furrows.
Straw	$S_1 S_1 S_2 S_2$	Breeds true for straw husk (Expected figures)	2 (3.125)	108 (108)	...	...	...
Straw	$S_1 S_1 S_2 s_2$	Segregates 3 straw: 1 black furrows (Expected figures)	2 (6.25)	80 (86.25)	35 (28.75)	...	...
Straw	$S_1 s_1 S_2 S_2$	Segregates 3 straw: 1 ripening gold (Expected figures)	5 (6.25)	204 (207)	...	72 (69)	...
Straw	$S_1 s_1 S_2 s_2$	Segregates 9 straw: 3 black furrows: 3 ripening gold: 1 ripening gold with black furrows. (Expected figures)	15 (12.5)	424 (411.19)	118 (137.06)	130 (137.06)	59 (45.69)
Black Furrows	$S_1 S_1 s_2 s_2$	Breeds true for black furrows (Expected figures)	3 (3.125)	...	139 (139)	...	...
Black Furrows	$S_1 s_1 s_2 s_2$	Segregates 3 black furrows: 1 ripening gold with black furrows. (Expected figures)	10 (6.25)	...	389 (372.75)	...	108 (124.75)
Ripening Gold	$s_1 s_1 S_2 S_2$	Breeds true for ripening gold (Expected figures)	2 (3.125)	...	...	97 (97)	...
Ripening Gold	$s_1 s_1 S_2 s_2$	Segregates 3 ripening gold: 1 ripening gold with black furrows. (Expected figures)	9 (6.25)	...	...	309 (327.75)	128 (109.25)
Ripening Gold with Black Furrows	$s_1 s_1 s_2 s_2$	Breeds true for ripening gold with black furrows. (Expected figures)	2 (3.125)	...	...	...	92 (92)

60. It will be seen that the observed figures fit the theory fairly well, with some indication of a slight association between the two inhibiting genes.

61. *Ripening Gold* x *Purple husk*.—In this study, the two varieties *Rupununi* and *Ramcajara* were employed as parents. Previous studies have demonstrated that the purple pigment in the husk of *Ramcajara* is dominant to the normal straw colour, the expression of the pigment depending upon the interaction of two complementary genes. In crosses between *Ramcajara* and other varieties, ratios of 9:7 and 3:1 have been observed, depending on the presence or absence of one of the genes in the other parent. In the cross between *Rupununi* and *Ramcajara*, the husk of the F_1 plants was straw with a faint purple tinge, showing the presence of an inhibitor for the purple pigment. The F_2 segregated into 325 straw or tinged: 89 full purple—to be exact, 258 straw: 67 tinged: 89 full purple.

62. If we assume a single factor difference, P, for the expression of purple pigment, and a factor I which partly inhibits this pigment, the constitution of the F_1 plants would be PpIi (tinged) and the F_2 would segregate into a ratio of 13 straw or tinged: 3 full purple. The observed figures do not fit the theoretical ratio very well, but this may be due to errors in classifying the F_2 plants, owing to gradations in the expression of the purple pigment. Considerable variation in the degree

of purple colouring is noticeable even in pure line cultures of the pigmented parent, *Ramcajara*. Errors of classification which became apparent in the F_3 cultures are shown below :—

- (a) F_3 culture No. 2 : F_2 plant classified as having straw husk, but progeny segregated into full purple and tinged. Correct classification : tinged or full purple.
 (b) F_3 culture No. 6 : F_2 plant classified as tinged, but progeny bred true for full purple. Correct classification : purple.
 (c) F_3 culture No. 11 : Similar to culture No. 6.

63. The 50 F_2 plants selected at random for a study of F_3 behaviour were classified according to husk colour as follows : 26 plants with straw husk, 10 plants with tinged purple husk, 14 plants with purple husk. These were grown in F_3 cultures and the results are described below.

64. The 14 plants with full purple husk gave the following results.

F_3 behaviour.	Number of F_3 families.	Segregation.		
		Straw.	Tinged.	Purple.
Breeding pure for purple husk ...	8	...	...	464
Segregating into purple and tinged husk (inhibitor present) ...	4	...	47	191
Segregating into purple and straw husk (inhibitor absent) ...	2	25	...	84

In the absence of the inhibitor it will be seen that the purple pigment behaves in the normal manner as a simple dominant.

65. The 10 plants with tinged purple husk gave an anomalous segregation in the F_3 cultures into 146 plants with green husk, 127 plants with tinged husk and 267 plants with purple husk. In no case was an F_3 culture found breeding true for tinged husk.

66. The F_3 cultures grown from the 26 F_2 plants with straw husk exhibited various types of inheritance, and are classified according to behaviour below :—

Number of F_3 families.	Segregation.			Remarks.
	Straw.	Tinged.	Purple.	
3	160	...	...	Pure recessive for P (purple pigment).
5	283	7	1	Homozygous for I (inhibitor).
7	315	33	18	Heterozygous.
11	226	185	186	Heterozygous.

67. The inheritance of purple husk colour in the cross *Rapununi* × *Ramcajara* has been dealt with at some length chiefly because there is no reference in the literature (as far as can be discovered) to an inhibitor of anthocyanic pigment in rice. The evidence cited above clearly demonstrates the presence of such an inhibitor, but does not make clear the nature of its action. The segregations observed in many of F_3 cultures do not support the original postulate of a single inhibiting gene, but rather the presence of two or more genes varying in their strength of action. In spite of unavoidable errors in the classification of husk colours, the anomalous results cannot be entirely accounted for on these grounds.

68. *Hairiness of Husk and Leaf*.—In the 1933 Divisional Reports, attention was drawn to the presence of hairs on the leaf and husk of certain varieties of rice. In the majority of varieties, the leaf and husk are covered with short bristles, not readily visible to the naked eye, but very obvious to the touch. This character has

been designated "Rough" (Rr) and examples are to be found in *Ramcajara* and No. 11.

Varieties which do not conform to this type may be classified as follows:—

- (a) Leaf covered with short bristles, but husk covered with long bristles. Example: *Loomee*. Inheritance studies have shown that this is a modification of the previous class.
- (b) Long hairs, sparsely distributed, chiefly on the underside of the leaf, giving it a silky appearance; husk perfectly smooth. This character has been designated "Silky" (Si si). Example: Only one variety of this type, *Louisiana*, has been recorded.
- (c) Husk and leaf perfectly smooth. Example: *Rupununi*.

69. Figures presented in the 1933 Divisional Reports showed very clearly that "Rough" is a simple dominant to "Smooth" giving very clear cut ratios of 3 rough : 1 smooth in the F_2 . F_3 figures now published clearly support this, as will be seen from Table XX below, 50 F_2 plants were reserved from each cross for these F_3 studies.

TABLE XX.
F₂ AND F₃ DATA ON THE INHERITANCE OF ROUGH AND SMOOTH LEAF.

Description of Cultures under observation.	Segregation.		Total.
	Rough leaf. Rough husk.	Smooth leaf. Smooth husk.	
<i>Loomee</i> x <i>Rupununi</i> .			
F ₂ segregation ...	214 (222)	82 (74)	296
F ₃ segregation (50 families):			
10 families pure rough	513	...	513
22 families segregating	854 (822)	255 (277)	1,109
18 families pure smooth	...	870	870
<i>Rupununi</i> x <i>Ramcajara</i> .			
F ₂ segregation ...	316 (315)	104 (105)	420
F ₃ segregation (50 families):			
16 families pure rough	707	...	707
27 families segregating	1,278 (1,217)	345 (406)	1,623
7 families pure smooth	...	386	386
<i>No. 11</i> x <i>Rupununi</i> .			
F ₂ segregation ...	279 (277)	90 (92)	369
F ₃ segregation (50 families):			
17 families pure rough	835	...	865
18 families segregating	705 (775.5)	209 (228.5)	914
15 families pure smooth	...	793	793

The figures in brackets are calculated on the basis of a predicted ratio of 3 : 1. It is evident that roughness of leaf and roughness of husk are produced by a single gene as no case of crossing over has been observed in 8,865 hybrid progeny.

70. "Silky" x "Smooth" Leaf.—This study was made in the cross between *Louisiana* (silky leaf and smooth husk) and *Rupununi* (smooth leaf and husk). The F_1 plants resembled *Louisiana* in having silky leaves and smooth husk. The F_2 segregation is shown below in Table XXI.

TABLE XXI.
INHERITANCE OF "SILKY" LEAF IN THE F₂ OF THE CROSS *LOUISIANA* x *RUPUNUNI*.

	Silky leaf Smooth husk.	Smooth leaf Smooth husk.	Total.
Observed figures ...	117	33	155
Expected (3 : 1) ...	116.25	38.75	155

The observed figures agree very closely with those calculated on the basis of an expected 3:1 ratio, showing that the "silky" character is a simple dominant to "smooth."

71. "*Silky*" x "*Rough*" Leaf.—It now remains to investigate the cross "silky" x "rough," and this study was made by crossing *Louisiana* (silky leaf and smooth husk) with (a) *Ramcajara* and (b) *No. 11*, both of which possess rough leaf and husk.

72. The F_1 plants of both these crosses differed from either of the parents in having the upper and underside of the leaves densely covered with long hairs, giving the leaves a distinctly "woolly" appearance. In each case, the husk resembled the "rough" parent, showing that the "silky" gene (*Si si*) does not affect the expression of husk hairs.

73. It has already been demonstrated that "rough" leaf and "silky" leaf are produced by single genes which behave as simple dominants to "smooth" leaf. The genetic composition of the "rough" parent may, therefore, be represented by *RR si si* and the "silky" parent by *rr Si Si*. The F_1 will be *Rr Si si* and, if the two genes are independent, the F_2 should segregate into the following ratio: 9 woolly : 3 rough : 3 silky : 1 smooth. The actual figures obtained are presented below in Table XXII.

TABLE XXII.
SHOWING F_2 SEGREGATIONS IN THE CROSSES BETWEEN "ROUGH" AND "SILKY" LEAF.

Nature of Cross.		Woolly leaf Rough husk.	Rough leaf Rough husk.	Silky leaf. Smooth husk.	Smooth leaf Smooth husk.	Total.
<i>Louisiana</i> x <i>Ramcajara</i>	...	308 (346.5)	190 (115.5)	75 (115.5)	43 (38.5)	616
<i>No. 11</i> x <i>Louisiana</i>	...	271 (329.06)	188 (109.69)	88 (109.69)	38 (36.56)	585

The figures in brackets are calculated on the basis of an expected 9:3:3:1 ratio. The observed figures deviate considerably from this ratio with a large excess of "rough" plants and a corresponding deficiency in the "woolly" and "silky" classes. The reason for this is not at all clear, as it could not be due to linkage. It might be explained by differential growth rate of the pollen tubes—the pollen tubes containing the *RR* genes growing faster than those containing the *Si Si* gene—but this is not a satisfactory solution unless it can be definitely proved. The question will be further investigated when homozygous "woolly" strains have been established.

74. Inheritance of "*Silky*" and "*Ripening Gold*".—The variety *Louisiana* possesses silky leaves and straw coloured husk, while the variety *Rupununi* has smooth leaves and the husk ripens to a golden colour. Both these latter characters are, as already demonstrated, recessive. The F_1 plants of the cross between these varieties exhibited silky leaves and straw husk. The F_2 segregation, shown below in Table XXIII, agrees very closely with the expected ratio of 9:3:3:1 and the figures in brackets have been calculated on this basis.

TABLE XXIII.
INHERITANCE OF *Si si* AND *S₁ s₁* IN THE CROSS *LOUISIANA* x *RUPUNUNI*.

		Silky leaf.	Smooth leaf.	Segregation of Ripening Gold husk.
Straw husk	...	89 (87)	28 (29)	117 (116)
Ripening gold husk	...	28 (29)	10 (10)	38 (39)
Segregation of silky leaf	...	117 (116)	38 (39)	

The above figures clearly indicate that the gene for silky leaf and inhibitor for ripening gold husk segregate independently.

75. *Summary of Inheritance Studies.*—The foregoing inheritance studies are summarised below in Table XXIV.

TABLE XXIV.
SUMMARY OF INHERITANCE STUDIES.

Characters studied.	F ₁	F ₂ segregation.
Black Furrows x Ripening Gold husk ...	Straw coloured	... Approximately 9 straw : 3 black furrows : 3 ripening gold : 1 ripening gold with black furrows. Supported by F ₂ data with indication of slight linkage.
Ripening Gold x Purple husk ...	Straw tinged with purple	... Obscure owing to presence of an incomplete inhibitor (or inhibitors) for purple pigment. Not elucidated by F ₂ data.
Rough x Smooth leaf ...	Rough	... 3 rough : 1 smooth. Supported by F ₂ data.
Silky x Smooth leaf ...	Silky	... 3 silky : 1 smooth.
Rough x Silky leaf ...	Woolly	... Does not agree with the expected ratio of 9 woolly : 3 rough : 3 silky : 1 smooth owing to a large excess of "rough" plants.

MISCELLANEOUS CROPS.

Papaws.

76. Two varieties have been kept under close observation during the year. These are :

(a) *Local No. 1.*—Seed obtained from Mr. Walcott, Pln. Hope, in 1930. The variety is dioecious, the female trees bearing large oblong fruits of good flavour. The trees are semi-dwarf in habit.

(b) *Panama.*—Seed obtained from Panama in 1932. The fruits are of two kinds : (i) oval, borne on trees with perfect flowers and (ii) spherical, borne on trees with purely female flowers. This variety is evidently a transitional stage in the evolution of the purely dioecious type. The fruits are rather small but of excellent flavour, while the trees tend to grow rather tall.

77. A record was kept of the number of fruits from each tree and the weight, length and girth of the fruits. The seeds were sown in September 1933, seedlings were basketed in November and were transplanted into the field in December. Flowering began in June 1934, and the first phase of fruiting extended from October 1934, to February 1935. A summary is given below in Table XXV. of the records made during the first phase of fruiting, and includes observations made during January and February 1935.

TABLE XXV.
RECORD OF FIRST PHASE OF FRUITING OF LOCAL NO. 1 AND PANAMA PAPAWS.

Variety.	No. of trees under observation.	Number of Fruits.		Weight of Fruits.		Mean Weight of fruits. lb.	Mean Length of fruits. in.	Mean Girth of fruits. in.
		Total.	No. of Fruits per tree.	Total	Weight per tree.			
<i>Local No. 1</i> ...	4	47	11.8	184.7	46.2	4.1	9.6	18.4
<i>Panama</i> (female trees) ...	12	146	12.2	120.5	10.0	.8	3.8	11.4
<i>Panama</i> (hermaphrodite trees) ...	30	502	16.7	293.1	9.8	.6	4.4	9.0

The *Local No. 1.*—Fruits varied from 1 lb. 10oz. to 7 lb. 14oz. in weight, the spherical *Panama* from 4oz. to 1 lb. 10oz. and the oval *Panama* from 3oz. to 1 lb. 2oz.

78. Pollination experiments showed that the *Local No. 1* flowers would develop fruit without fertilisation, though the resulting fruit is smaller than the normal, of

inferior quality and is, of course, seedless. The *Panama*, however, will not develop fruit unless fertilised.

79. *Cold Storage Trials*.—The keeping quality of these two varieties at temperatures ranging from 32°–40°F. has been tested in preliminary trials. It soon became apparent that the *Local No. 1* was valueless on account of the susceptibility of the outer skin to fungus blemishes, while the *Panama* was not attacked in this manner. Attention was, therefore, concentrated on the latter variety. Three temperatures were available at Messrs. Wieting & Richter's cold storage plant, viz. 32°F., 35°F. and 40°F. and every facility was offered for the carrying out of these trials. The three points under investigation were:—

- (a) Correct stage at which to pick the fruit.
- (b) Duration of storage. After storage the fruits were kept one day in a domestic refrigerator and then allowed to ripen.
- (c) Temperature during storage.

80. The results obtained with fruits placed in cold storage at three different stages of ripeness are summarised below:—

- (a) Fruits picked when just turning colour and placed immediately in cold storage.

Duration of Storage.	Temperature.	Observations.
2 weeks ...	32° F.	...Fruits ripened poorly with considerable breaking down of tissues. Flavour: poor.
2 weeks ...	35° F.	...Slightly better than above.

Conclusions : Unsatisfactory.

- (b) Fruits picked when just turning colour and kept until full colour develops without being fully ripe and then placed in cold storage.

Duration of Storage.	Temperature.	Observations.
2 weeks ...	32° F.	...Ripened fairly well. Many fruits showed signs of collapse of tissues. Flavour: fair.
2 weeks ...	35° & 40° F.	...Ripened well. Fruits on the whole better than above. Flavour: good.
3 weeks ...	35° & 40° F.	...Ripened fairly well. About 50% of the fruits of no value.

Conclusions : Two weeks storage at 35°–40° F. fairly satisfactory.

- (c) Fruits allowed to develop full colour on the tree before picking. The results obtained were similar to those recorded above, with some indication that the fruits allowed to ripen on the tree react better than those allowed to ripen after picking. There is, of course, a greater chance of bird damage if the fruit ripens on the tree.

81. *General Conclusions*.—Best results are obtained at 35°–40° F. with fruits allowed to develop full colour (without being absolutely ripe) on the tree, or with fruits picked when turning colour and allowed to develop full colour in a dark place before placing in cold storage. Such fruits can be kept satisfactorily for a period of two weeks, but must be consumed within a day of removing to a domestic refrigerator. After two weeks, the quality of the fruit falls off considerably. The variety *Panama* is more suitable than *Local No. 1*, as it is fairly immune to damage by fungi.

82. Reciprocal crosses have been made between *Panama* and *Local No. 1* with a view to evolving a large fruited type with the flavour and keeping quality of the *Panama*.

82. Two varieties were received during the year, viz. *Mamie* from the Department of Agriculture, British Honduras and *Mexico* from the Department of Agriculture, Trinidad.

Chillies.

84. Further experiments have been conducted with the two varieties *Tinnerelly* and *Canadian* which were selected in 1933 as being the most suitable types for curing. A great deal of difficulty was experienced in retaining a uniform colour when drying the fruits in the sun. A large number had to be discarded owing to bleaching and the presence of fungus spots. The following table gives some idea

of the proportion of dried peppers to ripe fruit and the proportion of fruit fit for export.

Fruit collected. lb. oz.	Total dried fruit. lb. oz.	Good Colour. lb. oz.	Discoloured. lb. oz.
11 9½	3 1½	1 13½	1 4½
...	9 15½	5 3	4 12½

85. A collection is being made of local types, some of which are of a suitable type for curing and export. Accurate records are being kept of yields and costs of cultivation. One variety was received viz. No. 9 from A. E. Archer, New Mexico.

Pineapples.

86. A collection was made of local indigenous types of pineapple. A list is given below of the varieties under observation :

From the North West District 5.6.34 :—*Tiger Head*, *Maipoori*, *Montserrat*, *Sugar Loaf*, *Curri-Curri* and *Water Pine*.

From Essequibo 5.6.34 :—*Karopiara*, *English Montserrat*, *Sweet Pine*, *White Pine (Large)*, *White Pine (Small)*, *Black Montserrat*, *Warakabra*, *Maipoori* and *Tiger Head*.

From Essequibo 10.6.34 :—*Khorokaroo*, *Waropana*, *Horeshenana*, *Yhanana*, *Sugar Loaf (Small)*, *Sugar Loaf (Large)*, *Karopiara* and *Indian Montserrat*.

From Penal Settlement, Mazaruni :—One variety.

Many of these varietal names are synonymous, while some of them are probably imported varieties cultivated under local names. For instance, *Water Pine* resembles *Smooth Cayenne* very closely.

87. Two types were introduced, viz. :—

Abacaxi from Brazil.

Triploid hybrid from University of Hawaii. This triploid was discovered among the normal diploid progeny of the cross between *Smooth Cayenne* and *Wild Brazil* and presents many features which render it an extremely suitable type for canning purposes.

Onions.

88. In addition to the red and white onion seed imported from Teneriffe for distribution, the following varieties have been introduced during the year for trial, with the object of selecting a type which will produce viable seeds under local conditions :—

Date Received.	Variety.	Origin
16. 5.34 ...	Red Bombay (shallot) ...	Department of Agriculture, Montserrat.
" ...	Red Madras (shallot) ...	do.
14.11.34 ...	Red Bombay (shallot) ...	do.
" ...	Red Globe ...	do.
" ...	White Nasik ...	do.
" ...	Red ...	St. Vincent (Teneriffe seed).
" ...	White Patna ...	Sutton & Sons, Ltd., India.

89. The *Red Bombay* and *Red Madras* received on May 16 were sown on June 21 and planted out in 32 sq. feet and 163 sq. feet, respectively. Some bulbs were reaped on October 19 and replanted on December 13. The remainder flowered on December 24, while the replanted bulbs flowered on January 21, 1935. Seeds of both varieties were collected.

90. *Storage of Onion Seed*.—Onion seed is imported annually by the Department of Agriculture from Teneriffe about September or October. Some is sown with the short rainy season (November and December) while the remainder is held

over until the long rainy season (May). Owing to the rapid deterioration of the seed, the following experiment was designed to discover a satisfactory method of maintaining the viability for the required period. Inferences drawn from other work of a similar nature indicated that viability would be prolonged by storing the seed in either a cold or a dry atmosphere.

91. Temperatures available for experimentation were; 30° F., 35° F., 40° F. and air temperature. At each of these temperatures, two air-tight jars containing onion seed were placed—one jar of each pair containing a drying agent, calcium chloride. The experiment was started in November, 1933, and concluded in October, 1934. Every fortnight 100 seeds from each jar were tested for viability in a seed tester. The percentages of germination are recorded in monthly averages in Table XXVI below;—

TABLE XXVI.
SUMMARY OF STORAGE TRIAL WITH ONION SEED.

Treatment.			Months from beginning of test.											
Temperature.	Calcium Chloride.		1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.
Air	Absent	...	40	44	39	34	40	11	7	5	1	1	...	...
do.	Present	...	42	46	53	54	41	47	58	32	40	47	48	38
40° F.]	Absent	...	41	55	62	54	51	61	54	50	51	57	54	41
do.	Present	...	42	54	41	54	37	52	51	47	44	53	46	30
35° F.	Absent	...	44	65	56	63	50	56	52	54	35	48	42	32
do.	Present	...	52	73	55	55	48	57	59	43	57	56	46	39
30° F.	Absent	...	47	64	50	63	43	56	46	46	51	56	48	43
do.	Present	...	54	60	60	60	47	60	50	42	44	49	46	36

92. As a further check on the above tests (which were carried out in a seed tester), the viability of the seed sown in seed-boxes under natural conditions was estimated during some of the latter months of the trial. The percentage germinations are set out in Table XXVII and confirm the results recorded in the seed-tester.

TABLE XXVII.
PERCENTAGE GERMINATION OF ONION SEED STORED UNDER DIFFERENT CONDITIONS AS RECORDED IN SEED-BOXES.

Treatment.			Months from beginning of test.			
Temperature.	Calcium Chloride.		7th.	9th.	10th.	11th.
Air	Absent	...	7	1	...	...
do.	Present	...	46	50	40	29
40° F.	Absent	...	61	36	41	25
do.	Present	...	47	29	43	21
35° F.	Absent	...	54	29	42	32
do.	Present	...	55	26	47	25
30° F.	Absent	...	60	51	45	31
do.	Present	...	59	47	44	29

93. After the 10th month the germination of the untreated seed fell to zero while up to the 12th month the viability of the treated seed was almost as good as at the beginning of the experiment. The addition of the drying agent at air temperature was just as effective as lowering the temperature. There appears to be no difference between the three low temperatures.

Bananas.

94. An experiment has been started with a view to testing the suitability of flood-fallowing worn out front lands for the cultivation of bananas. A field at the Experiment Station, Georgetown, consisting of 14 beds each 42 rods x 2 rods, was set aside for this purpose and was put under water toward the end of August. The field will be taken in in 1935 as follows:

- 6 beds with *Dwarf*.
- 6 beds with *Gros Michel*.
- 2 beds with plantains.

SEED AND PLANT INRODUCTION.

95. A summary is given below of the seed and planting material introduced during 1934.

Crop.	Variety.	Quantity.	Origin.
Padi	48 varieties	Small quantities of each	Various Departments of Agriculture, India.
	10 "	"	Department of Agriculture, Federated Malay States.
	14 "	"	Department of Agriculture, Tanganyika.
	7 "	"	Ministry of Agriculture, Egypt.
	2 "	"	Department of Agriculture, Siam.
	5 "	"	Department of Agriculture, North Borneo.
	5 "	"	Agricultural Institute, Java.
Pineapple	Abacaxi	Suckers $3\frac{1}{4}$ lb.	Brazil.
	Triploid hybrid	15 planting pieces	University of Hawaii.
Peppers	No. 9	Small packet	A. E. Archer, New Mexico.
Pawpaw	Mamie	1 packet	Department of Agriculture, British Honduras.
Cover Crops	Crotalaria spectabilis	$1\frac{1}{2}$ oz.	Department of Agriculture, Dominica.
	" <i>vasculosa</i>	$1\frac{1}{2}$ oz.	do.
	" <i>verrucosa</i>	$1\frac{1}{2}$ oz.	do.
	Sesbania Aegyptiaca	$2\frac{1}{2}$ oz.	Imperial College of Tropical Agriculture, Trinidad.
	" <i>speciosa</i>	1 oz.	Royal Botanic Gardens, Kew.
Onion	Red Madras	1 packet	Department of Agriculture, Montserrat.
	Red Bombay	2 packets	do.
	Red Globe	$6\frac{1}{2}$ oz.	do.
	White Nasik	$6\frac{1}{2}$ oz.	do.
	Red	2 lbs.	Department of Agriculture, St. Vincent.
	White Patna	1 packet	Sutton & Sons, Ltd., India.

L. E. CODD,
Plant Breeder.

March 15, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT ON THE SUGAR EXPERIMENT STATIONS FOR THE
YEAR 1934.

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REPORT ON THE SUGAR EXPERIMENT STATIONS FOR THE YEAR 1934.

The Cane Agronomist, Mr. C. H. B. Williams, resumed duty on June 27, after spending an academic year in the Graduate School of Arts and Sciences of Harvard University, Cambridge, Massachusetts, U.S.A. Mr. MacArthur was on sick leave from December 28, 1933 to January 31, and Mr. Forte from August 20 to September 2. Mr. St. G. Cooper, a graduate of the Imperial College of Tropical Agriculture, joined the staff on August 15.

GENERAL.

Committee.

2. The Sugar Experiment Stations' Committee comprised, at the beginning of the year:

The Director of Agriculture	—Chairman.
The Hon. G. E. Anderson	—Pln. Diamond.
Mr. J. C. Gibson	—Pln. Port Mourant.
Mr. C. Farrar	—Messrs. S. Davson & Co., Ltd.
The Hon. M. B. G. Austin	—Messrs. Curtis Campbell & Co., Ltd.
Mr. A. Murison	—Pln. Uitvlugt.
Mr. J. Bee	—Pln. Albion.

Mr. C. L. C. Bourne —Secretary to the Committee.

3. The Director of Agriculture being absent from the Colony on leave from May 1 to September 19, 1934, the Deputy Director of Agriculture acted as Chairman for the period.

The Hon. G. E. Anderson having resigned from the Committee on his departure from the Colony, Mr. R. E. Rhodes of Pln. Diamond was appointed in his stead. Mr. W. H. Richards of Pln. Lusignan acted for Mr. Murison when the latter was absent from the Colony.

Finance.

4. The amount voted from the funds of the Sugar Experiment Stations' Committee for 1934 was \$18,034, and the amount actually spent was \$18,133.67. Receipts from assessments for the year amounted to \$18,038.40, those from other sources (sale of canes, etc.) to \$3,173.02.

5. A grant of \$4,320 was made from the Colonial Development Fund; the amount spent from the grant was \$4,319.16.

6. The joint contribution from Messrs. Booker Bros., McConnell & Co., Ltd. and Messrs. Imperial Chemical Industries was continued. A total of \$2,095.08 was spent under this head.

7. The Station also administered a special grant of \$1,356 by the British Guiana Sugar Producers' Association, allocated to the continuation of the work with the Amazon Fly, the newly introduced parasite of the small moth borer. The amount spent was \$872.31.

Equipment.

8. The laboratory constructed for the use of the Entomologist-in-Charge of the moth-borer investigations has been extended and a great deal of the mesh in the insectary renewed. The roofs of this laboratory, the store, millhouse and watchman's quarters have been painted. The old bridge connecting the office compound with the fields has been rebuilt. Considerable extension has been made to the paal-off of the west navigation trench along the buildings' compound and also on one side of the cross canal between Fields 6 and 7 West leading to the aqueduct.

The driveway connecting the Station with the main avenue of the Botanic Gardens has been surfaced with stone, oiled and rolled.

The Crossley engine and one of the experimental mills were taken down towards the end of the year and their foundations levelled.

FLOOD DAMAGE.

9. Consequent on the excessive rainfall experienced in December 1933 and January 1934, it was found necessary to abandon the following trials :—

Cane Grove—	21 P.,	Variety Trial,	Plants.	
	21 P.,	Manurial	„	„
	22 P.,	„	„	„
Non Pareil —	14 Ent.,	Variety	„	First Ratoons.
	59 E.,	„	„	Second „
Lusignan —	22 B.,	M.R.	„	„
Sophia —	4 E.,	„	„	„
	14 E.,	„	„	„
	3 W.,	„	„	First „
	6 W.,	2 „	Trials,	Plants.
	12 W.,	Manurial Trial,	First Ratoons.	
	14 W.,	Variety	„	„
	15 W.,	„	„	„
Uitvlugt —	10 Z.,	„	„	Second „

10. The loss of these experiments and the damage caused to others (*e.g.* the flood-fallow trials at Lusignan) will necessarily give the work a considerable setback and greatly retard the accumulation of data urgently required. Thus, the loss of the two manurial trials at Cane Grove will delay the determination of the nitrogen requirements of pegasse land (for a complete cycle of three crops) until the latter part of 1937. Two of the first trials with 1930 seedlings were lost in 6 W., Sophia, and the only trial where the 1928 seedlings were being tested on pegasse land was lost at Cane Grove. Similarly, anxiously awaited ratoon results with such canes as D. 9/28, D. 11/28, Diamond 10, P.O.J. 2878, etc., were lost at Non Pareil, Sophia and Uitvlugt.

CANE BREEDING AND INTRODUCTION.

11. The number of Demerara seedlings undergoing field experimentation and those undergoing further multiplication and selection are listed under their year of production in Tables I and II, respectively.

TABLE I.

DEMERARA SEEDLINGS IN REPLICATED TRIALS, DECEMBER 1934.

Year Bred.	Number of Seedlings.	Year Bred.	Number of Seedlings.
1912	1	1922	8
1913	3	1927	5
1917	4	1928	13
1918	5	1929	10
1920	9	1930	84
1921	15		
		Total	157

TABLE II.

DEMERARA SEEDLINGS UNDERGOING SELECTION AND MULTIPLICATION, DECEMBER 1934.

Year Bred.	Number of Seedlings.	Year Bred.	Number of Seedlings.
1917	3	1929	18
1920	3	1929	11
1921	10	1930	24
1922	13	1931	4
1923	1	1932	11
1927	18	1933	15,175
		Total	15,301

12. Table III shows the crosses attempted in 1933, the number of seedlings from each cross basketed, and the number subsequently transplanted to the field. These seedlings are, at the time of writing, undergoing their first field selection on the basis mainly of habit, weight per stool and brix. The following mean figures for the seedlings already selected give some idea of the standard of selection ;—

Number of seedlings selected	...	...	173
Mean number of stalks per stool	...	...	7.46
„ weight per stool, lb.	...	...	27.95
„ Brix.	...	...	19.53
„ weight per stalk, lb.	...	...	3.75

TABLE III.
PARENTAGE OF THE 1933 SEEDLINGS BASKETED AND TRANSPLANTED.

Parents.			Arrows.	Boxes Sown.	Seedlings Basketed.	Seedlings Transplanted to Field.
Female.		Male.				
P.O.J. 2878	x	Diamond 10	21	25	223	195
„	x	D. 625	5	8	7	6
Co. 281	x	Diamond 10	9	9	607	416
Co. 210	x	„	4	2	...	...
S.C. 12 (4)	x	„	8	17	2,118	2,066
G. 312	x	„	2	2	280	255
B.H. 10 (12)	v	„	5	5	20	14
Berbice	x	„	3	9	1,244	1,167
C. Roxa	x	„	1	3	78	52
S.W. 3	x	„	3	3	276	254
M.P.R. 42	x	„	4	3	30	26
M.P.R. 145	x	„	3	6	5	5
M.P.R. 44	x	„	3	5	65	63
M.P.R. 803	x	„	1	3	91	84
T. 1198	x	„	3	12	161	147
Diamond 10	x	D. 625	11	10	1,924	1,479
„	x	S.W. 3	2	2	282	247
„	x	B.H. 10 (12)	5	3	832	377
„	x	Co. 281	5	3	600	533
D. 625	x	Diamond 10	6	6	900	615
D. 602/22	x	„	12	14	80	65
D. 666/18	x	„	8	20	1,583	1,456
D. 666/18	x	D. 625	2	6	685	651
D. 66/30	x	„	2	6	1,264	910
D. 66/30	x	D. 53/27	1	3	...	...
D. 814/12	x	Diamond 10	7	10	126	60
D. 53/27	x	„	5	11	1,440	791
D. 438/21	x	„	5	11	1,006	819
D. 219/30	x	„	4	7	240	195
D. 684/21	x	„	7	12	903	722
„	x	D. 602/22	4	4	110	105
D. 75/28	x	Diamond 10	2	1	59	39
D. 2/30	x	„	4	3	126	105
D. 1159/22	x	„	8	6	480	383
D. 895/22	x	„	5	4	49	45
D. 628/21	x	„	7	5	...	...
D. 78/27	x	„	5	4	360	299
D. 11/28	x	„	8	4	15	15
D. 88/30	x	„	4	5	600	450
P.O.J. 2725	x	Sorghum	2	2	14	5
P.O.J. 2878	x	„	2	2	33	25
D. 1/32	x	„	2	2	53	34
Total	...	...	208	278	18,974	15,175

13. The crosses attempted in 1934 are listed in Table IV. It is gratifying to be able to record a fair germination among the *Sorghum* x *Saccharum* hybrids. Back-crosses between such hybrids (obtained in 1933) and *Saccharum* have, however, only yielded six seedlings.

TABLE IV.
CROSSES ATTEMPTED IN 1934.

PARENTS.		Arrows	Boxes Sown.	PARENTS.		Arrows.	Boxes Sown.
Female.	Male.			Female.	Male. ¹		
Armstrong	x Diamond 10 ...	3	4	D. 516/20	x Diamond 10 ...	4	3
Ba. 6835	x " ...	6	1	D. 557/20	x " ...	2	1
B.H. 10 (12)	x " ...	1	...	D. 424/21	x " ...	4	4
Bourbon	x " ...	3	3	D. 438/21 (Self)	x " ...	1	2
B. 1529	x " ...	6	3	D. 573/22	x " ...	3	...
Co. 213	x " ...	4	2	D. 602/22	x " ...	14	10
Co. 281	x " ...	5	3	D. 927/22	x " ...	2	4
D. 625	x D. 66/30 ...	7	...	D. 53/27	x " ...	10	6
F.C. 916	x Diamond 10 ...	4	1	D. 134/27	x " ...	3	...
G. 119	x " ...	2	...	D. 1/25	x " ...	8	12
I.C.T.A. 86	x " ...	3	4	D. 11/23	x " ...	6	4
Meligeli	x " ...	1	2	D. 50/28	x " ...	4	4
M.P.R. 42	x " ...	4	3	D. 7/30	x " ...	7	12
M.P.R. 49	x " ...	5	...	D. 13/30	x " ...	6	5
M.P.R. 146	x " ...	3	1	D. 51/30	x " ...	4	4
M.P.R. 151	x " ...	6	2	D. 63/30	x " ...	4	4
P.R. 803	x " ...	1	1	D. 66/30	x D. 625 ...	2	4
P.R. 826	x " ...	3	2	D. 66/30	x Diamond 10 ...	12	23
P.O.J. 2714	x " ...	2	...	D. 73/30	x Co. 281 ...	6	8
P.O.J. 2725	x " ...	4	6	D. 73/30	x Diamond 10 ...	7	10
P.O.J. 2725	x Co. 281 ...	3	3	D. 78/30	x " ...	4	3
P.O.J. 2725	x Sorghum ...	2	3	D. 80/30	x " ...	4	8
P.O.J. 2763	x " ...	2	1	D. 81/30	x " ...	4	5
P.O.J. 2763	x Diamond 10 ...	15	11	D. 88/30	x " ...	7	2
P.O.J. 2763	x Co. 281 ...	3	4	D. 83/30	x D. 66/30 ...	6	...
P.O.J. 2878	x Diamond 10 ...	18	13	D. 135/30	x Diamond 10 ...	3	6
P.O.J. 2878	x Sorghum ...	1	2	D. 178/30	x " ...	11	12
P.O.J. 2878	x D. 625 ...	6	4	D. 182/30	x " ...	4	7
P.O.J. 2878	x D. 66/30 ...	4	...	D. 1/33	x " ...	2	2
T. 1198	x Diamond 10 ...	5	3	D. 2/33	x " ...	3	2
S.W. 3	x " ...	1	3	D. 3/33	x " ...	3	...
S.C. 12 (4)	x " ...	8	12	D. 3/33	x D. 66/30 ...	2	1
D. 118/02	x " ...	1	1	D. 4/33	x Diamond 10 ...	3	1
D. 814/12	x " ...	4	4	D. 5/33	x " ...	3	...
D. 663/13	x " ...	2	1	D. 6/33	x " ...	2	...
D. 666/18	x " ...	2	3				
D. 351/20	x " ...	6	...				
				Total	...	325	275

14. In addition to the canes listed in Table I and the variety Diamond 10, the following introduced canes are also being experimented with:—B. 417, B. 726, B. 755, Berbice, Co. 210, Co. 213, Co. 281, G. 119, P.R. 820, P.O.J. 253, P.O.J. 2753, P.O.J. 2878 and T. 1198.

15. No canes have been introduced during the year. Arrangements have, however, been made to import a number of varieties through the newly-established quarantine station at Trinidad.

EXPERIMENTATION.

Experiments Reaped.

16. *Variety trials.*—Of thirty-eight variety trials reaped during the year, ten were fully reported on in *Sugar Bulletin* No. 3. The remainder will be considered in detail in *Sugar Bulletin* No. 4. It will suffice here to draw attention to the following salient features of the results:—

1. Diamond 10 and P.O.J. 2878 have maintained their early promise and further extension appears to be justified. It is not yet clear which is the better of the two canes but they will both outyield D. 625 in most instances;
2. D. 11/23, the result of a cross between S.C. 12 (4) and D. 625, has outyielded D. 625 in four out of the five plant cane trials in which they have met and in both first ratoon trials so far reaped. Table V. shows the comparative data at present available for these two canes.

TABLE V.
COMPARISON OF RESULTS FROM D. 625 AND D. 11/28.

Cycle Age.	Mean of	Variety.	Tons Cane per Acre.	Tons Sucrose per Acre.	% Sucrose in Cane.	Juice Purity.	Glucose Ratio.
Plants	... Five Trials	D. 11/28	40.56	4.99	12.43	85.9	8.18
		D. 625	38.69	4.67	12.21	82.8	11.36
First Ratoons	... Two Trials	D. 11/28	24.88	3.23	13.03	88.2	4.91
		D. 625	22.19	2.85	13.11	85.6	7.64
Two Crops	...	D. 11/28	65.44	8.22	...	...	...
		D. 625	60.88	7.52	...	...	...

The plant cane trials were reaped at Port Mourant, Non Pareil, La Bonne Intention, Sophia and Uitvlugt, and the first ratoon trials at the two last points.

3. Co. 213, which outyielded D. 625 as a plant cane in Field 2 W., Sophia, gave 1.68 tons sucrose in cane per acre more than the standard as a first ratoon in the same field.

4. In Field 89 G. D., Diamond, P.O.J. 2727 gave, in three crops, 1.11 ton sucrose in cane per acre more than Diamond 10.

5. As a first ratoon in Field 90 G. D., P.O.J. 2753 gave a 15 per cent. increase in yield over Diamond 10.

6. The results mentioned under 3, 4 and 5 above point to the importance of giving the thinner canes a thorough trial.

7. Of the older seedlings, D. 666/18 will, on account of its heavier tonnage of cane, yield, on the average, about 5 per cent. more sucrose per acre than D. 625, over a cycle of three crops, but its juice is somewhat inferior to that of the standard variety. D. 747/13, D. 195/17, D. 52/20, D. 241/21, D. 309/21, D. 628/21 and D. 927/22 have given heavy yields and are worthy of further trial.

8. Of the newer seedlings reaped only as plant canes, the following showed marked increases over D. 625, viz: D. 171/29, D. 39/30, D. 49/30, D. 66/30, D. 67/30, D. 75/30, D. 113/30, D. 170/30, D. 173/30 and D. 232/30.

9. D. 625 is below the average in juice quality, for a major portion of the canes tested have higher purities and lower glucose ratios.

17. *Manurial Trials.*—Of eighteen manurial experiments reaped during the year, thirteen were fully reported on in *Sugar Bulletin* No. 3. The remainder will be considered in detail in *Sugar Bulletin* No. 4, for at the time of writing several other trials of the same series remain to be harvested. The trials reaped to date confirm the dose of 2 cwt. sulphate of ammonia per acre as being the most desirable for plant canes of D. 625 on flooded frontland and indicate an application of 4 cwt. sulphate of ammonia per acre as advisable for first ratoons. Some of the trials on pégasse land were destroyed by the floods and insufficient data are available for this type of soil. There are indications that 6 cwt. sulphate of ammonia per acre, in the presence of one ton of lime or limestone, may prove advantageous, but further confirmation is needed before a definite recommendation can be made. The results of liming trials indicate that no marked increase in yield is likely to ensue from the application of lime-bearing materials to flooded frontland soils. In some cases, such dressings, at the rate of one ton per acre, have proved remunerative on pégasse land.

18. Two flood-fallowing trials were reaped, one at Port Mourant and the other at Lusignan. The latter was severely damaged by the floods, however, and it is doubtful if much reliance can be placed on the data obtained. The results will be discussed in the next *Sugar Bulletin*.

Experiments in Progress.

19. During the year 11 variety and 19 manurial trials were started. Flood damage to important nurseries at Sophia rendered the establishment of more variety

trials impossible. The nurseries were re-established as rapidly as possible and some are yielding planting material at the time of writing, but there has, nevertheless, been an unavoidable delay of a year in the sorting out of the many varieties being tested.

20. The manurial trials started include: several series designed to determine the nitrogen requirements of P.O.J. 2878 and Diamond 10 both as plants and as ratoons; one chain of Latin Squares concerning the optimum dressing of phosphatic fertilizers; another involving the application of different types of phosphatic manures; a third to determine the relative efficiency of sulphate of ammonia and calcium cyanamide on pegasse soils; and a fourth involving small dressings of lime and limestone to frontland soils.

21. Table VI lists the various experiments in progress, their location, layout, etc. It will be seen that at the end of the year there were in progress 42 variety, 29 manurial and 4 flood-fallowing experiments.

TABLE VI.
EXPERIMENTS IN PROGRESS, DECEMBER 1934.

Estate.	Field.	Kind of Experiment.	No. of		Cycle Age.	Date Started or Reaped.	Layout.
			Treatments.	Replicates.			
BERBICE—							
Skeldon	7 F.M.	Manurial	4	4	1st Rat.	4.10.34	Lat. Sq. (3)
"	8 E.M.	"	4	4	"	4.10.34	" (3)
"	8 S.	"	4	4	Plants	8. 9.34	" (3)
Port Mourant	28 A.E.	Variety	6	6	1st Rat.	4. 4.34	Lat. Sq.
"	15 A.	"	11	6	"	20. 4.34	Ran. Flocks.
"	14 A.	"	7	7	2nd Rat.	12. 4.34	"
"	11 T.L.	"	9	6	Plants	10.10.34	"
"	4 H.E.	Manurial	4	4	1st Rat.	23. 2.34	Lat. Sq.
"	13 R.	"	5	5	Plants	6. 1.34	"
"	28 T.L.	Flood-Fallow.	4	4	"	28. 1.34	"
"	28 T.W.	"	4	4	1st Rat.	4. 9.34	"
Albion	31 K.	Manurial	5	5	Plants	31. 8.34	"
Rose Hall	30 R.H.	"	4	4	1st Rat.	7. 3.34	"
"	19 L 20	"	5	5	"	16.10.34	"
"	20 T.	"	5	5	Plants	27. 3.34	"
Blairmont	18 R.	Variety	12	7	3rd Rat.	10.10.34	Ran. Blocks
"	4 H.	"	9	7	2nd Rat.	8.11.34	"
"	24 R.	"	6	6	Plants	16.11.34	Lat. Sq.
"	15 H.P.	Manurial	5	5	1st Rat.	9.11.34	"
"	71 B.L.	"	5	5	Plants	4. 8.34	"
EAST DEMERARA—							
Cane Grove	51 M.	Manurial	5	5	"	14. 4.34	Lat. Sq.
"	53 M.	"	5	5	"	14. 4.34	"
"	63 M.	"	5	5	"	31. 3.34	"
"	5 N.L.B.P.	"	5	5	"	3.11.34	"
Enmore	8 B.A.	"	4	4	1st Rat.	23. 2.34	"
"	16 E.P.	"	5	5	Plants	28. 7.34	"
Lusignan	38 A.	Variety	10	7	2nd Rat.	6. 2.34	Ran. Blocks
"	4 F.	Manurial	5	5	1st Rat.	27. 2.34	Lat. Sq.
"	28 E.G.H.	"	4	4	"	6. 3.34	"
"	26 W.	"	4	4	"	11. 9.34	" (3)
"	F.	Flood-Fallow.	4	4	Plants	17. 3.34	"
"	H.	"	4	4	1st Rat.	29. 9.34	"
La Bonne Intention	22 C.M.	Variety	6	6	"	3.11.34	"
"	14 M.W.	Manurial	5	5	Plants	20. 7.34	"
Ogle	61 O.	Variety	8	8	2nd Rat.	27. 9.34	"
"	45 O.	Manurial	5	5	Plants	28. 7.34	"
"	45 O.	"	4	4	"	28. 7.34	" (3)
Sophia	1 E.	Variety	8	8	2nd Rat.	28. 9.34	"
"	3 E. (a)	"	10	5	Plants	18. 4.34	Ran. Blocks
"	3 E. (b)	"	10	5	"	18. 4.34	"
"	11 E. (a)	"	7	5	1st Rat.	20. 9.34	"
"	11 E. (b)	"	7	5	"	20. 9.34	"
"	11 E. (c)	"	7	5	"	20. 9.34	"
"	11 E. (d)	"	7	5	"	20. 9.34	"
"	12 E. (a)	"	5	5	"	18. 9.34	Lat. Sq.
"	12 E. (b)	"	5	7	"	18. 9.34	Ran. Blocks
"	13 E. (a)	"	7	5	"	13. 9.34	"
"	13 E. (b)	"	7	5	"	13. 9.34	"
"	13 E. (c)	"	7	5	"	13. 9.34	"
"	13 E. (d)	"	7	5	"	13. 9.34	"
"	16 E. (a)	"	7	5	"	12. 9.34	"
"	16 E. (b)	"	7	5	"	12. 9.34	"
"	16 E. (c)	"	7	5	"	12. 9.34	"
"	16 E. (d)	"	7	5	"	12. 9.34	"
"	1 W.	"	4	8	2nd Rat.	1.10.34	"
"	2 W.	"	5	9	"	2.10.34	"
"	5 W.	"	6	5	Plants	17.10.34	"
"	6 W. (a)	"	6	6	"	29. 4.34	Lat. Sq.
"	6 W. (b)	"	6	6	"	29. 4.34	"
"	7 W.	"	7	5	"	8.11.34	Ran. Blocks
"	8 W.	"	14	5	"	31.10.34	"
"	9 W.	"	9	9	"	30.11.34	Lat. Sq.

TABLE VI.—(Continued).

Estate.	Field.	Kind of Experiment.	No. of		Cycle Age.	Date Started or Reaped.	Layout.
			Treat-ments.	Repli-cates.			
Sophia	10 W.	Variety.	7	10	2nd Rat.	27.11.34	Ran. Blocks
"	11 W.	"	7	10	1st Rat.	12. 3.34	"
"	13 W.	"	10	7	Plants	6. 4.34	"
"	16 W.	"	9	7	1st Rat.	13. 3.34	"
Diamond	90 G.D.	"	3	7	2nd Rat.	4.10.34	"
WEST DEMERARA—							
Wales	4 B.	Variety	8	6	1st Rat.	19. 3.34	Ran. Blocks
"	9 C.	Manurial	5	5	Plants	24. 2.34	Lat. Sq.
Versailles	31 R.D.Z.	"	5	5	1st Rat.	15. 3.34	"
Cornelia Ida	N.E.A.	"	5	5	Plants	19.10.34	"
Uitvlugt	13 E.	Variety	11	7	2nd Rat.	16.11.34	Ran. Blocks
"	94 M.Z.	Manurial	5	5	"	16.11.34	Lat. Sq.
"	14 Z.	"	4	4	1st Rat.	9. 3.34	"
"	33 E.	"	5	5	Plants	20. 2.34	"

22. Table VII summarises, for each variety, the number of experiments in which it occurs and their cycle ages. It should be noted that several of the importations of recent years from Barbados, Puerto Rico, Trinidad, etc., have now reached the experimental stage and that whereas most of the older seedlings are being discarded, those bred in recent years form the bulk of the varieties being tested. At the same time any canes which gave promise in the earlier trials are being rapidly multiplied and put back into new tests for confirmation. This is the case with such canes as D. 92/17, 195/17, 52/20, 241/21, 309/21, 573/22, 895/22 927/22, etc.

TABLE VII.
VARIETIES IN REPLICATED TESTS, DECEMBER 31, 1934.

Variety.	No. of Experiments as				Total No. of Experiments per variety.	Variety.	No. of Experiments as				Total No. of Experiments per variety.
	Plants.	1st Ra-toons.	2nd Ra-toons.	3rd Ra-toons.			Plants.	1st Ra-toons.	2nd Ra-toons.	3rd Ra-toons.	
B. 417	1	...	...	...	1	D. 424/21	...	...	...	1	1
B. 726	1	...	...	...	1	D. 438/21	...	...	...	...	2
B. 755	1	...	...	...	1	D. 444/21	...	1	...	...	1
Berbice	...	...	1	...	1	D. 548/21	...	2	...	...	2
D. 625	10	19	9	1	39	D. 628/21	...	1	1	...	3
Diamond 10	4	3	3	1	11	D. 661/21	...	...	1	...	1
Co. 210	...	1	1	...	2	D. 684/21	...	2	...	1	3
Co. 213	...	1	1	...	2	D. 857/21	...	...	2	...	2
Co. 281	...	1	1	...	2	D. 880/21	...	...	1	...	1
G. 119	3	1	1	...	5	D. 573/22	...	2	1	...	3
P.R. 820	1	...	...	...	1	D. 602/22	...	...	5	1	6
P.O.J. 253	...	1	1	...	2	D. 648/22	...	...	1	...	1
P.O.J. 2753	...	...	1	...	1	D. 895/22	...	2	1	...	3
P.O.J. 2878	6	2	3	...	11	D. 927/22	...	1	...	...	1
T. 1198	1	...	...	...	1	D. 1034/22	...	...	1	...	1
D. 814/12	...	2	1	1	4	D. 1159/22	...	3	...	...	3
D. 663/13	...	...	2	1	3	D. 1221/22	...	...	1	...	1
D. 695/13	...	...	2	1	3	D. 8/27	...	...	1	...	1
D. 747/13	...	1	1	...	2	D. 53/27	...	...	1	...	1
D. 73/17	...	1	...	...	1	D. 67/27	...	1	...	...	1
D. 92/17	1	1	...	...	2	D. 87/27	...	1	...	...	1
D. 195/17	1	...	1	...	2	D. 134/27	...	1	...	...	1
D. 404/17	...	2	...	...	2	D. 1/28	...	2	1	...	4
D. 611/18	...	...	1	...	1	D. 3/28	...	1	3	...	4
D. 666/18	...	1	...	1	2	D. 4/28	...	2	1	2	5
D. 668/18	...	1	...	...	1	D. 9/28	...	1	2	1	4
D. 794/18	...	...	1	...	1	D. 10/28	...	1	2	1	4
D. 835/18	...	...	3	1	4	D. 11/28	...	3	2	2	7
D. 52/20	2	...	...	...	2	D. 13/28	...	1	3	...	4
D. 203/20	1	1	...	...	2	D. 15/28	...	1	2	...	3
D. 204/20	...	...	1	...	1	D. 23/28	...	1	1	...	3
D. 207/20	...	1	...	...	1	D. 24/28	...	...	1	2	3
D. 349/20	...	2	...	...	2	D. 30/28	...	1	...	...	1
D. 351/20	...	...	...	1	1	D. 50/28	...	1	...	...	1
D. 516/20	...	...	1	...	1	D. 154/28	...	2	1	...	3
D. 557/20	...	...	...	1	1	D. 2/29	...	1	...	...	1
D. 682/20	1	...	...	...	1	D. 16/29	...	1	...	...	1
D. 6/21	...	2	1	...	3	D. 18/29	...	1	...	...	1
D. 92/21	...	...	1	...	1	D. 69/29	...	1	...	...	1
D. 163/21	...	...	1	...	1	D. 76/29	...	2	...	...	2
D. 206/21	...	1	...	...	1	D. 140/29	...	1	...	...	1
D. 241/21	1	...	1	...	2	D. 171/29	...	1	...	...	1
D. 309/21	1	1	...	...	2	D. 178/29	...	1	...	...	1

TABLE VII.—(Continued).

Variety.	No. of Experiments as				Total No. of Experi- ments per variety.	Variety.	No. of Experiments as				Total No. of Experi- ments per variety.
	Plants.	1st Ra- toons.	2nd Ra- toons.	3rd Ra- toons.			Plants.	1st Ra- toons.	2nd Ra- toons.	3rd Ra- toons.	
D. 180/29	...	1	...	...	1	D. 89/30	...	1	...	...	1
D. 184/29	...	1	...	...	1	D. 103/30	...	1	...	...	1
D. 1/30	...	1	...	...	1	D. 113/30	...	1	...	...	1
D. 2/30	...	1	...	...	1	D. 136/30	...	1	...	...	1
D. 3/30	...	1	...	...	1	D. 138/30	...	1	...	...	1
D. 5/30	...	1	...	...	1	D. 142/30	...	2	...	...	2
D. 7/30	...	1	...	...	1	D. 143/30	...	1	...	...	1
D. 8/30	...	1	...	...	1	D. 146/30	...	1	...	...	1
D. 10/30	...	1	...	...	1	D. 147/30	...	1	...	...	1
D. 13/30	...	1	...	...	1	D. 148/30	...	1	...	...	1
D. 14/30	...	1	...	...	1	D. 149/30	...	1	...	...	1
D. 19/30	...	1	...	...	1	D. 150/30	...	1	...	...	1
D. 31/30	...	1	...	...	1	D. 151/30	...	1	...	...	1
D. 36/30	...	1	...	...	1	D. 152/30	...	1	...	...	1
D. 39/30	...	1	...	...	1	D. 157/30	...	1	...	...	1
D. 41/30	...	1	...	...	1	D. 160/30	...	1	...	...	1
D. 43/30	...	1	...	...	1	D. 164/30	...	1	...	...	1
D. 45/30	...	1	...	...	1	D. 165/30	...	1	...	...	1
D. 46/30	...	1	...	...	1	D. 167/30	...	1	...	...	1
D. 47/30	...	1	...	...	1	D. 168/30	...	1	...	...	1
D. 48/30	...	1	...	...	1	D. 170/30	...	1	...	...	1
D. 49/30	...	1	...	...	1	D. 173/30	...	1	...	...	1
D. 50/30	...	1	...	...	1	D. 174/30	...	1	...	...	1
D. 51/30	...	1	...	...	1	D. 175/30	...	1	...	...	1
D. 52/30	...	2	...	...	2	D. 179/30	...	1	...	...	1
D. 54/30	...	1	...	...	1	D. 181/30	...	1	...	...	1
D. 62/30	...	1	...	...	2	D. 182/30	...	1	...	...	1
D. 63/30	...	1	...	...	1	D. 190/30	...	1	...	...	1
D. 64/30	...	2	...	...	2	D. 205/30	...	1	...	...	1
D. 66/30	...	1	...	...	2	D. 215/30	...	1	...	...	1
D. 67/30	...	1	...	...	1	D. 218/30	...	2	...	...	2
D. 71/30	...	1	...	...	1	D. 219/30	...	1	...	...	1
D. 72/30	...	1	...	...	1	D. 220/30	...	1	...	...	1
D. 74/30	...	1	...	...	1	D. 221/30	...	1	...	...	1
D. 75/30	...	1	...	...	1	D. 222/30	...	1	...	...	1
D. 78/30	...	1	...	...	1	D. 223/30	...	1	...	...	1
D. 79/30	...	1	...	...	1	D. 224/30	...	1	...	...	1
D. 81/30	...	1	...	...	1	D. 230/30	...	1	...	...	1
D. 83/30	...	1	...	...	1	D. 231/30	...	1	...	...	1
D. 84/30	...	1	...	...	1	D. 232/30	...	1	...	...	1
D. 85/30	...	1	...	...	1	D. 235/30	...	1	...	...	1
D. 87/30	...	1	...	...	1	D. 236/30	...	1	...	...	1
D. 88/30	...	1	...	...	1	D. 237/30	...	1	...	...	1

23. In continuation of some preliminary investigations carried out in 1933, a further series of growth measurements has been started on certain fields of both plant and ratoon cane, and the various fields are receiving different treatment as regards the frequency of irrigation. Determinations of soil moisture content are made at the same time measurements are taken, and in one field the amount of material produced at regular intervals is being determined by reaping and weighing certain plots, stalk counts being made just before reaping. The work has not yet reached a stage when anything definite can be reported.

24. Further studies were made of the root distribution of D. 625, Diamond 10 and P.O.J. 2878. In this connection 560 samples were taken during the year. The taking and washing of root samples is laborious and costly under local conditions and data must, in consequence, be accumulated gradually. It is hoped, however, to be able to report on the findings during 1935.

MISCELLANEOUS.

25. *Cane Sold*.—During the year 380 puntloads of cane were sold to Pln. Ogle for \$2,767.31.

26. *Soil Samples* totalling 400 were taken by the Station's staff and submitted to the Chemist-Ecologist for examination. These include material for a soil survey of Pln. Ruimveldt.

27. *Cane Samples*.—Two thousand four hundred and twenty-five samples, weighing 53.31 tons, were crushed and analysed during the year.

28. *Plant Distribution*.—39,978 cuttings were distributed during 1934. These included a few cuttings each of D. 625, D. 11/28, D. 49/30, D. 66/30 and Diamond 10 sent to the Central Quarantine Station at Trinidad. It was found that for the short journey to Trinidad it was quite sufficient to pack the cuttings in dry cotton wool in sealed tins. Twelve bottles of fluff were sent to the Estacion Experimental Agricola de Tucuman, Argentina.

29. *Publications*.—*Sugar Bulletin* No. 3 was issued during the year, the Agronomist, Field Manager and Chemist-Ecologist collaborating in its preparation. The Agronomist contributed to Volume V. of the *Agricultural Journal of British Guiana* "The Present Cane Variety Situation in British Guiana," and, in collaboration with Mr. H. D. Huggins, "Some Price and other Relationships of Fertilizers in British Guiana." Several notes were prepared for distribution to the local press. Monthly reports on the work in progress were regularly submitted, and a half-yearly report was prepared for the Sugar Experiment Stations' committee.

30. *Rainfall*.—Table VIII. compares the monthly rainfall at Sophia with the monthly average for the 14-year period 1921-1934.

TABLE VIII.
COMPARISON OF THE RAINFALL AT SOPHIA FOR THE YEAR 1934 WITH THE AVERAGE.

Month.				1934	Average 1921-34
				Inches.	Inches.
January	...	...	...	29.71	8.89
February	...	...	...	1.31	3.46
March	...	...	...	3.42	4.03
April	...	...	...	2.23	4.87
May	...	...	...	3.42	11.40
June	...	...	...	9.35	14.13
July	...	...	...	10.56	10.66
August	...	...	...	3.86	8.29
September	...	...	...	1.50	2.63
October	...	...	...	4.78	3.94
November	...	...	...	4.98	6.00
December	...	...	...	6.04	14.81
Total	...	...	...	81.16	93.11

It will be seen that the total fall was 12 inches below normal and that what actually fell was very abnormally distributed. The January rainfall was over 300 per cent. of the average (37 per cent. of the total precipitation), while those of all the other months except July and October were sub-normal.

31. Visits entailing 197 days were paid to sugar estates by members of the Staff during the period under review.

32. In conclusion the writer desires to thank the Managers and Staffs of the sugar estates for their many courtesies, and to express to Messrs. Follett-Smith, Cameron and other colleagues of the Department of Agriculture and the Sugar Experiment Station, his gratitude for their hearty co-operation, especially during his prolonged absence from the Colony.

C. HOLMAN B. WILLIAMS,
Sugar Cane Agronomist.

January 31, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE CHEMICAL DIVISION FOR THE YEAR 1934.

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REPORT OF THE CHEMICAL DIVISION FOR THE YEAR 1934.

GENERAL.

2. The staff of the Division were on duty during the whole of the period under review. From October 18 to the end of the year the Chemist-Ecologist was on tour in the Rupununi District and the Pakaraima Range and during this period the Assistant Chemist was in charge of the laboratory.

3. The total number of samples examined during the year has increased considerably due to the fact that the Division has received assistance from a supernumerary staff employed as a result of the receipt of grants from the Colonial Development Fund, Imperial Chemical Industries, Ltd., and Messrs. Booker Bros., McConnell & Co. Ltd. In addition, Mr. J. F. Williams, employed by the latter firm, has spent the year in the laboratory studying agricultural and industrial problems connected with the sugar industry. Apart from his routine work of collecting and examining 412 soil samples for advisory purposes, Mr. Williams carried out experiments on the preparation of a decolourising carbon from bagasse (*Trop. Agr.* XI, 5, 107) and commenced some preliminary work on the electrodialysis of soils which was discontinued on account of lack of a suitable supply of direct current. He was also engaged in tracing the nitrogen transformations in calcium cyanamide stored under tropical conditions. Later in the year in connection with sugar factory control Mr. Williams prepared several antimony electrodes and standardised them against the hydrogen electrode.

4. The Division has been occupied with general agricultural chemical work both on the coastlands and in the interior of the Colony. Early in the year the Chemist-Ecologist visited, in the company of officials of the United Fruit Company, the neighbouring Colony of Dutch Guiana. Rapid surveys of the river lands of British Guiana were made in connection with the possibility of an export trade in bananas. A number of advisory visits were paid to the estates of the Colony during the year. A certain amount of attention has been paid to the laboratory aspects of flood-fallowing. The information gained during the execution of the detailed soil surveys of sugar estates, described in previous reports, was summarised in popular form and published during the year for distribution to estates' staff. A considerable amount of time has been devoted to the design and statistical examination of field experiments with sugar-cane. The work has entailed the analysis of soil samples from the sites of experiments and the laboratory examination of a large number of cane samples. The preparation of the third sugar bulletin engaged the attention of the Division for some time. Other work connected with the Colony's premier industry has included the examination of cane leaf material from the plots of a manurial experiment, the analysis of blighted cane leaves and the application of the use of the refractometer in the selection of sugar-cane seedlings.

5. The pineapple canning industry has received assistance from the Division in regard to the examination of fruit, finished products and by-products. A pot experiment concerning the manurial requirements of the pineapple has been in progress during the year. While the factory was working investigations were made concerning the usefulness of the refractometer both in the field and in the factory. The work is described in later paragraphs.

6. Numerous samples of pasturage submitted by the Government Veterinary Surgeon have been examined regarding their mineral constituents.

7. The coumarin content of local Tonka beans has been compared with that of the Trinidad bean.

8. The Sugar Agronomist was absent on leave from the beginning of the year until June 27, and the work at the Sugar Experiment Station during this period was supervised by the Chemist-Ecologist.

Examination of Samples.

9. The following samples have been examined during the year :

TABLE I.

Soils	...	...	583
Sugar-canes	...	...	2,425
Seedling cane juices	...	...	311
Cane leaf material	...	...	27
Pineapples	...	...	25
Fertilisers	...	...	15
Pineapple products	...	...	9
Honeys	...	...	9
Forage crops	...	...	7
Tonka beans	...	...	3
Miscellaneous samples	...	...	34

Under the miscellaneous heading are included samples of padi, of irrigation waters and of furnace ash.

10. The number of samples examined by the Division in the past five years is shown in Table II.

TABLE II.

	1930	1931	1932	1933	1934
Soil samples	649	436	362	527	583
Sugar-cane samples	71	793	1,134	2,490	2,736
Other samples	54	116	20	107	128

The number of soil samples reported in the table does not include the 412 samples collected and analysed in this laboratory by Mr. J. F. Williams. While the number of samples examined during the year has increased it is not anticipated that such an increase will be maintained in the future. In previous years when the preliminary soil survey was in hand a large number of samples were collected and examined by simple and rapid methods. In the future the work is likely to consist of a more detailed study of fewer samples. Much time is still devoted to the examination of soil samples from sugar estates for advisory purposes. It is to be hoped that arrangements will be made to provide staff for this routine work and thus permit the Division to confine itself to the investigation of soil problems, the proper sphere of its activities.

SOIL INVESTIGATIONS.

Sugar-Cane Soils.

11. *Advisory Visits.*—During the year eleven advisory visits were paid to the sugar estates of the Colony. The visits were chiefly concerned with instances of crop failure or with the possibility of taking in new land.

12. It has been noticed during the inspection of certain areas of pegasse soil that cane growth presented a very patchy appearance. Soil samples collected from adjacent sites in good and bad patches have been examined in the laboratory and the main difference appears to be one of acidity. Determinations of the theoretical lime requirement by the Hardy—Lewis method differentiate between the soils from the good and bad areas. Laboratory results are presented in Table III.

TABLE III.
THEORETICAL LIME REQUIREMENT, PER CENT.

	Good Patches.		Bad Patches.	
	Topsoil.	Subsoil.	Topsoil.	Subsoil.
Pln. Non Pareil, Field 93	1.15	1.13	1.39	1.41
Pln. Providence, Field 23 P.	1.18	1.12	1.39	1.32

These values are of use when the reclamation of areas of pegasse soil is being considered for extended cane cultivation.

13. During the year the attention of the Division was called to a plant cane field of D. 625 on one of the East Coast estates. Six inches of the tips of the leaves had assumed a golden yellow colour and the field had the appearance of being swept by fire. Previous inspection by the Entomologist had disclosed the absence of any pest. Full grown canes were split and it was found that many of the internodes presented a large cavity which was not due to the activities of any insect. Samples of soil, cane and cane leaves were collected and examined in the laboratory. The management were advised to inundate the field for twelve hours and this treatment appeared to be successful. Soil samples collected from good and bad patches showed no marked differences. The blighted leaf material contains similar amounts of potash and phosphate, less nitrogen and total ash but more manganese and chlorine than unblighted leaf material. Circumstances did not permit the estimation of boron in the leaf material. Specimens of the cane and leaf material were preserved. Instances of blight accompanied by hollow internodes are occasionally noticed. It is possibly connected with the lack of some minor element which is rendered available by flooding.

14. *Flood-fallowing*.—The Laboratory Assistant, Mr. L. A. Robinson, has conducted during the period under review a considerable amount of laboratory work in connection with the problem of flood-fallowing (*Trop. Agr.* X, 4, p. 91-5, *Div. Report*, 1933, p. 89., 1932, p. 105, 1931, p. 76). The results here reported were obtained by the comparison of samples of soil withdrawn from limited areas immediately before and immediately after routine flood-fallowing.

15. Preliminary experiments were confined to four small areas of about three square yards. Three of these areas were situated at Pln. Versailles and the initial sampling was carried out by the Manager, Mr. R. B. Hunter. The other area was situated at Pln. Cane Grove. During these preliminary investigations determinations were made of the normal and exchange reaction, the contents of exchangeable and water-soluble lime, magnesia, potash and soda, the amounts of carbon, nitrogen, soluble salts and available iron, the values for the lime requirement and the rate of solution. The results are presented in a condensed table of differences.

TABLE IV.
TOPSOILS. DIFFERENCES OBTAINED WITH SAMPLES COLLECTED BEFORE AND AFTER FLOODING.
FINAL VALUE MINUS INITIAL VALUE.

					Cane Grove.	Versailles.				Mean.
					P. 21.	VS. 31.	MT. 49.	MT. 53.		
Normal pH	...	...	...	..	+ 0.36	- 0.24	- 0.20	- 0.07	...	
Exchange pH	...	...	...	...	+ 0.22	- 0.31	- 0.25	- 0.19	...	
Exchangeable and water-soluble (mgm. eqs. /100 gms)										
Lime	...	...	...	...	+ 1.48	+ 0.01	+ 0.10	+ 0.26	+ 0.46	
Magnesia	...	...	...	...	+ 0.26	- 0.57	- 0.73	+ 0.54	...	
Potash	...	...	...	...	+ 0.15	- 0.21	+ 0.3	- 0.07	...	
Soda	...	...	...	...	+ 0.21	- 0.05	- 0.22	- 0.13	...	
Magnesia: Lime ratio	...	...	...	...	- 0.77	- 0.28	- 0.18	+ 0.76	...	
Carbon %	...	...	...	...	- 0.61	- 0.23	- 0.12	- 0.17	- 0.13	
Nitrogen %	...	...	...	...	- 0.002	- 0.005	- 0.001	- 0.011	- 0.005	
Carbon: nitrogen ratio	...	...	...	...	- 0.65	- 1.93	- 0.83	- 0.72	- 0.895	
Soluble salts %	...	...	...	...	+ 0.007	- 0.005	+ 0.11	+ 0.003	...	
Available iron (mgm. eqs. /100 gms.)	...	...	...	...	+ 1.20	+ 2.14	+ 6.11	+ 6.32	+ 3.97	
Lime requirements % CaCO ₃	...	...	...	...	- 0.006	- 0.029	- 0.006	- 0.123	- 0.041	
Rate of solution	...	...	...	...	+20	-18	+15	+26	...	

Although the results indicate that in all four fields there has been an increase in the amount of iron and lime and a decrease in the amount of the carbon, nitrogen and in the lime requirement values yet these differences cannot be considered statistically significant.

16. In two instances, fields 31 VS and 49 MT, three composite samples were withdrawn on each occasion from each small area. These samples were separately examined in the laboratory and the results are amenable to statistical examination. It can be shown that flood-fallowing in the field 31 VS has been responsible for a large increase in the amount of available iron in both topsoil and subsoil, for a considerable decrease in the amount of organic matter in the topsoil and for a definite narrowing of the carbon : nitrogen ratio in both topsoil and subsoil. The odds are 100:1 in favour of the significance of these differences. There has also been a definite (odds 20:1) decrease in the amount of exchangeable and water-soluble potash in the topsoil. In field 49 MT flood-fallowing has had the definite effect (odds 100:1) of increasing the amount of available iron in both topsoil and subsoil, of augmenting the amount of soluble salts in the topsoil and of increasing the value for rate of solution in the subsoil. At the same time it has been responsible for a definite decrease in the amount of potash in the subsoil, soda in the topsoil and organic matter in the topsoil. Flooding also narrowed the carbon : nitrogen ratio in the topsoil.

17. Shortly after this preliminary work had been completed sixty-four soil samples were withdrawn from the site of a field experiment concerning flood-fallowing in field No. 28, Tain Leeward, Pln. Port Maurant. The experiment took the form of a four by four latin square and the treatments consisted of plots which had been flooded for twelve months, for six months, for four months and not flooded at all. In addition each plot was divided into two subplots. On one subplot ground limestone at the rate of one ton per acre had been applied before flooding. On the other subplot limestone was to be applied after flooding. Topsoil and subsoil samples were withdrawn from each subplot immediately after the flooding water had been released and before the second application of ground limestone was made. The laboratory analysis of these samples and the statistical examination of the results obtained gave interesting findings.

18. Flood-fallowing had no definite effect upon the organic matter content of topsoil or the subsoil.

A definite decrease in acidity was found to have occurred in the topsoil, the values are shown in Table V.

TABLE V.				
NORMAL REACTION. pH. TOPSOIL.				
Flood-fallowed soil	...	...	...	5.66
Unflooded soil	...	...	...	5.48
Significant difference	...	...	...	= 0.09
'Z' value obtained	...	...	...	= 1.1645
'Z' value required	P = 0.05	...	...	= 0.8948

An application of ground limestone at the rate of one ton per acre before flooding had no definite effect upon the soil reaction.

Neither flood-fallowing nor the limestone application had an effect upon the exchange reaction or the theoretical lime requirement of either the topsoil or the subsoil.

Definite increases of available iron were demonstrated in both topsoil and subsoil. The results are shown in Tables VI. and VII.

TABLE VI.
AVAILABLE IRON. MGM. EQS./100 GMS. TOPSOIL.

Duration of flooding	...	12 months	6 months	4 months	nil
Available Fe_2O_3	...	2.66	1.28	2.09	0.11
Significant difference	...		0.45		
'Z' value obtained	...				= 2.0057
'Z' value required	P=0.01	...			= 1.1401

Flood-fallowing definitely increased the available iron content of the topsoil. It was apparent, too, that the time of immersion affected the amount of iron rendered available. The greatest amount was found in the twelve-month plots. There was definitely less in the four-month plots. It is surprising to find that the six-month plots contained the least amount of iron of all the flooded soils.

TABLE VII.
AVAILABLE IRON. MGM. EQS. /100 GMS. SUBSOIL.

Duration of flooding	12 months	6 months	4 months	nil
Available Fe_2O_3	0.34	0.24	0.28	0.15
Significant difference		0.08		
'Z' value obtained				=1.0503
'Z' value required $P=0.95$				=0.7798

Flood-fallowing definitely increased the available iron content of the subsoil (odds 100 : 1). As in the case of the topsoil the time of immersion affected the amount of available iron and it will be seen that the run of the figures are similar. There was no definite difference between the twelve-month and the four-month plots or between the four-month and six-month plots, but there was definitely more available iron in the subsoil of the twelve-month plots than in the subsoil of the six-month plots. In Table VIII is shown the effect of an application of one ton per acre of ground limestone before flooding on the amount of available iron subsequently found in the subsoil.

TABLE VIII.
AVAILABLE IRON. MGM. EQS. /100 GMS. SUBSOIL.

Ground limestone before flooding	...	0.27
No ground limestone before flooding	...	0.23
Significant difference	...	= 0.02
'Z' value obtained	...	= 1.2523
'Z' value required $P = 0.05$	...	= 1.1577

In this experiment flood-fallowing definitely reduced the amount of soluble salts found in the topsoil. It was without effect upon the salinity of the subsoil. The results obtained are shown in Table IX.

TABLE IX.
PERCENTAGE OF SOLUBLE SALTS. TOPSOIL.

Flood-fallowed land	...	0.050
Land not flood-fallowed	...	0.067
Significant difference	...	= 0.009
'Z' value obtained	...	= 1.2857
'Z' value required $P = 0.05$	...	= 0.8948

In a previous case, field 49 MT, flood-fallowing definitely increased the salinity of the topsoil. The apparent drop in salinity in the present case is explained when the significant interaction between flooding and time of application of limestone is considered.

TABLE X.
PERCENTAGE OF SOLUBLE SALTS. TOPSOIL.

	Flood-fallowed.	Significant Difference.	Not Flood-fallowed.
Limestone before flooding	0.048	...	0.083
No Limestone before flooding	0.053	0.023	0.050
Significant Differences	0.016		0.032
'Z' value obtained	...	...	=0.922
'Z' value required $P = 0.05$	...	...	=0.8163

An application of limestone on land not flooded produced a subsequent increase in the amount of soluble salts. There was no difference in the salinity of the soil before and after flooding where no initial limestone application was made. On the

other hand flood-fallowing reduced the amount of soluble salts produced by the preliminary limestone dressing.

The values obtained for the rate of solution in the topsoil were markedly increased by flooding. No such change is to be noted in the subsoil.

TABLE XI.
RATE OF SOLUTION. TOPSOIL.

Duration of flooding	...	12 months	6 months	4 months	nil
Rate of solution	...	132	90	157	23
Significant difference	...	...	44		
'Z' value obtained					= 1.3753
'Z' value required $P=0.01$					= 1.1401

In this case the duration of flooding had a pronounced effect. The twelve-month plots did not differ sensibly from the four-month and six-month plots. On the other hand the values for the four-month plots were definitely higher than those of the six month plots.

The topsoil samples were examined as regards their crumb hardness by a modification of the method proposed by the Sudan workers. Flood-fallowing definitely reduced the crumb hardness of the soil. The results appear in Table XII.

TABLE XII.
CRUMB HARDNESS. TOPSOIL.

Flood-fallowed soil	...	...	...	91.7
Soil not flood-fallowed	...	...	...	93.9
Significant difference	...	...	...	= 1.1
'Z' value obtained				= 1.4302
'Z' value required $P=0.01$				= 1.3103

Flood-fallowing and the preliminary application of ground limestone had no effect upon the topsoil contents of soluble and exchangeable lime, magnesia or soda. The initial limestone dressing, however, had an effect upon the magnesia:lime ratio.

TABLE XIII.
MAGNESIA: LIME RATIO. TOPSOIL.

Limestone before flooding	...	...	1.58
No Limestone before flooding	...	...	1.62
Significant difference	...	...	= 0.02
'Z' value obtained	...	...	= 1.3113
'Z' value required P=0.05	...	...	= 1.1577

Both flood-fallowing and the preliminary application of ground limestone had definite effects upon the topsoil content of exchangeable and soluble potash.

TABLE XIV.
SOLUBLE AND EXCHANGEABLE POTASH. MGM. EQS./100 GMS. TOPSOIL.

Flood-fallowed soil	...	...	...	0.43
Soil not flood-fallowed	...	...	...	0.33
Significant difference	...	...	...	= 0.08
'Z' value obtained				= 0.9713
'Z' value required $P=0.05$				= 0.8948
Limestone before flooding	...	...	...	0.39
No limestone before flooding	...	...	...	0.42
Significant difference	...	...	...	= 0.01
'Z' value obtained				= 1.2965
'Z' value required $P=0.05$				= 1.1577

The results of all tests indicate that flood-fallowing increases the amount of available iron in both topsoil and subsoil. In some cases the content of organic

matter is reduced and the carbon:nitrogen ratio is narrowed. The amounts of soluble and exchangeable potash and of water soluble salts are sometimes increased and at other times decreased. Values for the rate of solution are usually increased. Flood-fallowing also reduces the crumb hardness of the soil.

19. In order further to trace the effect of flood-fallowing upon the availability of iron, arrangements were made to withdraw successive layers of flooded soil in order to estimate the distribution of available iron and manganese after flooding for four months. The results obtained with two soils are given in Table XV.

TABLE XV.
AVAILABLE IRON AND MANGANESE. MGM. EQ3 /100 GMS. SOIL.

Layers.	Clay Topsoil, Demerara.		Layers.	Clay Topsoil, Berbice.	
	Iron.	Manganese.		Iron.	Manganese.
0" -0.3"	10.9	3.1	0" -0.3"	14.6	1.2
0.3"-0.7"	34.2	0.9	0.3"-0.7"	14.9	1.2
0.7"-1.1"	38.9	1.3	0.7"-1.1"	17.3	1.2
1.1"-1.7"	40.7	1.0	1.1"-1.5"	16.3	0.8

There is a tendency for more iron and less manganese to be available in the lower layers of the soil. It was noticed, during submergence that while the bulk of the soil assumed a blue-grey tinge the surface to a depth of about 0.3 inches had a red-brown colour suggestive of oxidation. It seems probable that ferric oxide is not so readily extractable by leaching with semi-normal acetic acid for in the present experiment, where the soil was not permitted to dry out before extraction, much larger amounts of available iron were obtained. Furthermore it has been noticed that the storage of samples of soil tends to reduce the amount of available iron.

20. Further work in this connection involves an investigation of the rate of formation of available iron in the presence and absence of small amounts of certain other substances and the effect of flood-fallowing and of applications of ferrous sulphate on the natural structure of the soil. It has been noticed that more silica appears in the leachings of flood-fallowed soils and this point requires study. The identification of the gas evolved when flooded soils are treated with acetic acid is also necessary.

21. Field experiments on the subject of flood-fallowing have indicated that, as far as the plant cane yields are concerned, flooding to a depth of three inches is just as effective as a deeper flooding of twelve inches. Sowing floating water plants has no immediate effect upon the yield but the addition of final molasses at the rate of five tons per acre appears to give an increase sufficient to offset the cost of the molasses. Any further increase in the ratoon crop may be regarded as profit. The field experiments dealing with the effect of varied periods of flooding are shortly to be reaped and will provide data for the correlation of yields with various soil characteristics already determined.

22. *Crumb Hardness.*—The results obtained in the examination of the soil samples from the Port Mourant flooding trial have permitted an investigation of the connection between the values obtained for crumb hardness and other soil determinations. The correlation coefficients obtained are given in Table XVI.

TABLE XVI.
CORRELATION COEFFICIENTS. TOPSOIL.

Variables.	r	Probability.
Crumb Hardness and Available Iron ...	-0.2491	P ...
Crumb Hardness and Lime* ...	-0.5246	P = 0.01
Crumb Hardness and Magnesia* ...	-0.1314	P ...
Crumb Hardness and Soda* ...	+0.6001	P = 0.01
Crumb Hardness and Potash* ...	-0.2566	P ...
Crumb Hardness and Soluble Salts ...	+0.4126	P = 0.02

* Exchangeable and water-soluble bases.

No connection is demonstrated between the crumb hardness value and the amount of available iron, or the exchangeable and water-soluble magnesia or potash. The value for the crumb hardness increases with the amount of exchangeable and water-soluble soda and with the amount of soluble salts but decreases with the amount of exchangeable and water-soluble lime.

The partial correlation between crumb hardness and soda, with lime, magnesia and potash eliminated is $r = +0.7830$. The partial correlation between crumb hardness and lime, with soda, magnesia and potash eliminated is $r = -0.4595$.

23. Other correlation coefficients obtained are given in Table XVII.

TABLE XVII.
CORRELATION COEFFICIENTS. TOPSOIL.
EXCHANGEABLE AND WATER-SOLUBLE BASES.

Variables.	r	Probability.
Potash and Lime ...	+0.0786	P ...
Potash and Magnesia ...	-0.3819	P = 0.05
Potash and Soda ...	+0.3737	P = 0.05
Lime and Magnesia ...	+0.6772	P = 0.01
Lime and Soda ...	-0.7863	P = 0.01
Magnesia and Soda ...	-0.6393	P = 0.01

Apparently a high content of potash is associated with a low content of magnesia and a high content of soda. A high content of lime is associated with a high content of magnesia and with a low content of soda. A high content of magnesia is associated with a low content of soda. In general large amounts of divalent bases are usually associated with smaller amounts of monovalent bases and accumulations of the latter are associated with small amounts of the former.

Sophia Profile.

24. The results of the laboratory examination of samples collected from two soil profiles were previously reported (*Rept. Chem. Div.* p. 96, 1932). A further pit was excavated and examined during the year at the Sophia Experiment Station.

TABLE XVIII.

Sample No.	Lower depth.	pH Normal.	pH Exchange.	Index of Texture.	% Soluble Salts.
D. 914 ...	6"	6.09	4.97	46	0.028
D. 915 ...	12"	5.52	4.19	49	0.046
D. 916 ...	18"	6.69	5.32	51	0.064
D. 917 ...	24"	7.98	6.51	51	0.077
D. 918 ...	30"	7.56	6.26	40	0.072
D. 919 ...	36"	7.63	6.36	55	0.104
D. 920 ...	42"	8.00	6.88	63	0.118
D. 921 ...	48"	8.04	7.02	58	0.165
D. 922 ...	54"	8.13	7.08	69	0.201
D. 923 ...	60"	8.23	7.23	57	0.210
D. 924 ...	66"	8.37	7.52	58	0.326
D. 925 ...	72"	8.43	7.64	58	0.373

The area had received a heavy application of ground limestone four years prior to sampling but has never supported good crops. None of the horizons is highly

acidic. The alkalinity reaches one maximum in the 18-24 inch layer; below this point it is slightly more acid but the alkalinity increases with depth. In general the soil texture increases with depth, there appears to be a layer of lighter soil in the 24-30 inch layer. The salinity increases regularly with depth but is not so marked as in the previous frontland soil profile examined. In the lower layers of the profile many pipe-like concretions were found and appeared to be fossilised root channels consisting mainly of iron oxide.

Ruimveldt Soils.

25. During the year members of the Sophia Experiment Station's staff carefully collected forty soil samples from Pln. Ruimveldt, East Bank, Demerara. It is hoped gradually to obtain representative samples from all estates which were not examined in detail during the surveys previously described. Ruimveldt soil samples have been submitted to preliminary examination and the following facts emerge.

Compared with the soils of the sugar estates on the East Coast the samples from Ruimveldt indicate that the topsoils are less acidic while the subsoils are much less acidic. The topsoils appear to be lighter in texture but the subsoils are very similar in texture. The topsoils possess a low salinity while the subsoils are much less saline than those of the East Coast of Demerara. Practically all the Ruimveldt soils contained a sufficiency of readily available phosphate.

Further laboratory work will be undertaken in this connection as time permits

McKenzie Empolder.

26. During the year the McKenzie Empolder was examined with regard to its suitability for cane farming. The soils of the Empolder are highly acidic pegassy clays possessing large theoretical lime requirements. It is unlikely that they will successfully support cane cultivation.

Analysis of Cane Leaves.

27. The Cane Agronomist collected for examination twenty-five samples of cane leaves, one from each plot of a five by five latin square designed to investigate the effect of varied dressings of superphosphate upon yield. The leaves collected were the second or third youngest on the stalk. Each leaf was cut at a point where its width was one inch and the upper part was discarded. The leaf was cut again at a point twelve inches below the first cut and the severed portion was retained for examination. The manurial treatments included in the field trial were as follows: (1) No superphosphate (2) 2 cwt. /acre superphosphate (3) 3 cwt. /acre superphosphate (4) 4 cwt. /acre superphosphate (5) 6 cwt. /acre superphosphate. The cane at the time of sampling was just over five months old and the fertilisers had been applied five months previously.

The samples were examined in the laboratory by Mr. L. A. Robinson who determined the nitrogen, potash and phosphate contents and subsequently examined the results statistically. The values obtained appear in the Table XIX.

TABLE XIX.
CANE LEAVES: PER CENT. OVEN DRY WEIGHT.

Superphosphate cwt./acre.	Nitrogen per cent.	Potash per cent.	Phosphate per cent.	RATIOS.		
				N/K ₂ O	P ₂ O ₅ /K ₂ O	N/P ₂ O ₅
0	1.73	1.20	0.476	1.44	0.397	3.63
2	1.61	1.20	0.463	1.34	0.396	3.48
3	1.69	1.29	0.466	1.31	0.362	3.62
4	1.68	1.26	0.474	1.33	0.376	3.55
6	1.67	1.29	0.505	1.30	0.396	3.30

The only definite effect which emerged from a study of the figures was that an application of superphosphate at the rate of 6 cwt. /acre increased the phosphate con-

tent of the cane leaf. The 'Z' value obtained was 0.7169 while that required for $P = 0.05$ is 0.5666. The significant difference is 0.037. On the basis of chemical examination the soil of the area was deficient in supplies of available phosphate. The plant cane crop is shortly to be reaped and it will be of interest to see whether the applications of fertilisers have had any material effect on yield.

Panama Soils.

28. Early in the year two representatives of the United Fruit Company paid an extended visit to the Colony in order to assess the possibilities of inaugurating an export trade in bananas. In the selection of land suitable for the commercial cultivation of the Gros Michel variety, the texture, acidity and salinity of the soil play an important part. At that time the Division had examined as regards acidity, texture and salinity over eight thousand samples of soil collected in widely distributed parts of the Colony. This information was placed at the disposal of the visitors and was of material assistance in selecting areas for personal observation. As a result their visits were mainly confined to the banks of the main rivers of the Colony and the Chemist-Ecologist accompanied them on many of these excursions. Fifty-four soil samples collected during the investigation were examined in the laboratory. The subject has been discussed in detail in a recent number of the *Agricultural Journal* (V, 3, pp. 148-165). The experts of the United Fruit Company considered that conditions were entirely unfavourable to the inauguration of an export banana industry in this Colony. They thought that the marked acidity of British Guiana soils presented a very real danger of rapid spread of Panama Disease, that the soil was unsuitable for production of good quality fruit on a commercial scale and that existing transport facilities would render handling expensive.

Surinam Soils.

29. About twenty-five years ago a costly experiment was made in the neighbouring Colony, Dutch Guiana, to establish an export trade of Gros Michel bananas. Due to the incidence of Panama Disease the venture was abandoned after three or four years. While the possibilities of a banana industry in this Colony were being considered it was deemed advisable that the soil which had supported cultivation in Surinam should be inspected, sampled and analysed. In consequence the Chemist-Ecologist paid a short visit to Dutch Guiana in company with Messrs. Sanderson and Dunlap. Ten soil samples were collected from various estates on the Surinam and Commewijne Rivers and were examined in the laboratory by Mr. L. A. Robinson. The results obtained are presented in Table XX.

TABLE XX.

Estate: Field:	D.G. 1 Peperpot A3	D.G. 2	D.G. 3 Peperpot B11	D.G. 4	D.G. 5 Sorgvliet	D.G. 6	D.G. 7 Rust en Werk 17	D.G. 8	D.G. 9 Rust en Werk	D.G. 10	Mean Topsoil	Mean Subsoil
Normal pH	4.40	4.36	4.77	4.53	4.90	5.03	4.77	4.73	4.95	5.47	4.76	4.82
Exchange pH	3.55	3.60	3.73	3.68	4.00	4.23	3.75	3.73	4.10	4.77	3.84	4.00
Lime requirement %	0.970	0.925	0.661	0.737	0.418	0.293	0.683	0.711	0.461	0.236	0.639	0.580
Lime requirement tons /acre	14.6	13.9	9.9	11.1	6.3	4.4	10.3	10.7	6.9	3.5	9.6	8.7
Carbon %	1.269	0.671	1.114	0.862	1.084	0.630	1.237	1.103	2.132	0.910	1.367	0.815
Nitrogen %	0.193	0.116	0.209	0.144	0.169	0.115	0.156	0.146	0.212	0.111	0.188	0.126
Carbon: nitrogen ratio	6.58	5.78	5.33	5.99	6.41	5.48	7.93	7.55	10.06	7.30	7.26	6.42
% Organic matter	2.19	1.16	1.92	1.49	1.87	1.09	2.13	1.90	3.68	1.40	2.36	1.41
Salts %	0.014	0.014	0.021	0.082	0.023	0.080	0.033	0.052	0.040	0.139	0.026	0.073
Rate of Solution	2	0	18	21	3	2	7	29	1	8	6	12
Index of Texture	54	48	50	51	50	54	55	57	53	54	52	53
Trueog P ₂ O ₅ p.p.m.	17	18	16	12	14	14	13	12	35	66	19	24
1% Citric acid P ₂ O ₅ %	0.0050	0.0022	0.0025	0.0018	0.0027	0.0010	0.0026	0.0030	0.0072	0.0074	0.0040	0.0031
Exchangeable and water-soluble bases mgm. eqs. /100 gms.												
Lime	1.42	1.20	1.51	1.18	4.51	3.96	2.98	2.53	4.37	4.24	2.96	2.62
Magnesia	2.74	1.38	10.41	9.65	11.46	13.36	10.15	9.50	14.14	16.53	9.73	10.08
Potash	0.29	0.31	0.27	0.28	0.38	0.32	0.67	0.38	0.77	0.68	0.46	0.39
Soda	0.25	0.23	0.72	1.84	0.59	1.90	1.12	1.85	0.74	1.84	0.64	1.53
Magnesia: lime ratio	1.93	1.15	6.89	8.18	2.54	3.37	3.41	3.76	3.24	3.90	3.60	4.07
Available Iron	1.54	0.37	1.44	0.70	1.19	0.38	0.81	0.95	0.25	0.34	1.01	0.55

The plantations visited were all river estates, Peperpot is situated about twenty-three miles up the Suriname River while Sorgvliet and Rust en Werk are on the Commewijne, some fifteen and eleven miles respectively from the sea. The estates are drained by gravity and do not possess organised water conservancies, such as obtain on the East and West Coasts of Demerara. The soils collected were similar in friability to the soils encountered on the estates situated on the lower reaches of the principal rivers of British Guiana. There appeared to be a greater proportion of sand reef soil in the areas traversed than is to be found on the coastal belt of this Colony.

30. The Surinam soils appear to be slightly more acidic than the clay soils of the sugar estates of this Colony. There is little difference, as regards acidity, between the topsoils and subsoils of the Surinam soils. In similar areas in this Colony the subsoils are usually more alkaline than the topsoils. The Surinam soils are distinguished by their low content of exchangeable and water-soluble lime and their high content of exchangeable and water-soluble magnesia. They appear to be well supplied with potash and to contain more exchangeable and water-soluble soda. Their contents of organic matter are lower while the amounts of nitrogen are similar to those contained in the clays of this Colony's sugar estates. The carbon : nitrogen ratios are narrower. The contents of available phosphate are lower than those encountered in East and West Demerara and are similar to those found in Berbice. The amounts of soluble salts are generally lower and the rates of solution are smaller.

The soils examined and sampled are similar to those occurring on the coastal belt of the Colony. Since their mode of formation is similar it is to be expected that the main differences would be attributed to variations in methods of drainage, cultivation and manurial practice.

SOILS OF THE INTERIOR.

Soils in the Vicinity of the Potaro and Tiboku Roads.

31. During the early part of the year a short visit was paid to the Potaro and to the Tiboku Road in order to make a reconnaissance survey of the soil types of the area, to inspect cultivations and to investigate the possibilities of agricultural settlement. There are two main soil types in the areas examined. The most extensive type is the wallaba sand, a white quartz sand. The agricultural possibilities of this type of soil are negligible and it should be left to support a covering of wallaba which may in future prove of considerable value. The red soil type, which varies in texture from clay to sand and usually contains considerable proportions of gravel in the form of ironstone nodules, is to be found in patches throughout the area traversed. Orchard crops might grow upon this soil but it is not likely to support permanent cultivation of ground provisions unless some definite system of soil renovation is undertaken.

The soils of the area are generally unsuited to any permanent settlement scheme which depends for its success entirely upon agriculture.

The Rupununi District and the Pakaraima Mountains.

32. During the last quarter of the year the Chemist-Ecologist toured the Rupununi District and the Pakaraima Mountains as a member of an advance party investigating the possibilities of Assyrian settlement in those areas. A number of samples of soils and pasturage were collected for laboratory examination. Reference will be made to the tour in the next annual report.

MANURIAL TRIALS.

Sugar-Cane.

33. A detailed statement of the manurial trials with sugar-cane reaped during the first half of the period under review was presented in *Sugar Bulletin* No. III.

The five manurial trials reaped during the last half of the year 1934 are listed in Table XXI.

TABLE XXI.

Estate.	Field No.	Object of Experiment.
Uitvlugt ...	75 Zeeburg ...	Ground limestone and slaked lime.
Uitvlugt ...	94 Met-en-Meerzorg ...	Optimum dose of nitrogen.
Blairmont ...	75 Haly Polder ...	Kind of phosphate fertiliser.
Rose Hall ...	19 Lot 20 ...	Kind of phosphate fertiliser.
Lusignan ...	28 We-t ...	Variety and dose of nitrogen.

The results of these experiments will be published in a further bulletin appearing during 1935.

34. Four new series of fertiliser experiments have been commenced during the period under review. One series of three five by five latin squares is designed to investigate the quantitative aspects of phosphatic manuring. A series of four five by five latin squares permits the comparison of the effects of sulphate of ammonia and calcium cyanamide in presence or absence of liming materials on pegasse soils. Another series of fifteen four by four latin squares is designed to furnish information regarding the nitrogen requirements of plant canes and ratoon crops of the varieties Diamond 10 and P.O.J. 2878 growing on flood-fallowed frontland soils. Preliminary survey trials with liming materials on flood-fallowed frontland soils have indicated that such applications have little or no effect during three crops upon the yield of cane. It is known, however, that the Colony's cane soils are becoming progressively more acidic and it is generally felt, in spite of the lack of any measurable response, that small applications of liming materials at the rate of from 10 cwt. to 1 ton per acre at planting are in the nature of an insurance against the tendency towards increased acidity. At the request of members of the Sugar Experiment Stations' Committee a series of five five by five latin squares, comparing the effects of applications of 10 cwt. and one ton per acre of ground limestone and slaked lime, has been established on flooded frontland soil. These numerous manurial trials were laid down by the Agronomist shortly after his return from leave. It is to be hoped that sufficient funds will be available to insure the reaping of these important experiments.

35. During the latter half of the year two of the three field trials devoted to a comparison of various sources of phosphate were reaped as plant canes. The soil of one experimental area was definitely deficient in supplies of available phosphate, as estimated by chemical examination. In this trial there was a considerable amount of uncontrolled variation which obscured the effects of treatment. The results, though not statistically significant, suggested that all forms of phosphate effected a considerable increase in weight of cane without improving the quality. The soil of the other experimental area, judged by chemical methods, was adequately supplied with available phosphate. In this experiment all the phosphate dressings had a beneficial and remunerative effect upon the sucrose content, the juice purity and the glucose ratio. The tonnage of cane was unaffected. These results are of considerable importance and suggest a line of investigation which should be of great interest to planters. It is possible that large areas of cane lands which do not, at present, receive applications of phosphatic manures might benefit considerably from such dressings. The problem requires the establishment of a large number of small latin squares along the sugar belt. In these squares the effects of applications of phosphates could be examined in relation to the values obtained by chemical analysis of soil samples collected from the trial sites. The matter is of such economic importance that it is to be hoped that funds will be made available for its study.

Padi.

36. Certain fertiliser trials with padi have been conducted by the Plant Breeder during the period under review. A discussion of the results will be found in the annual report of this officer.

Pineapples.

37. In the early part of the year a second manurial trial with Smooth Cayenne pineapples was established at Pln. Charters, Demerara River. The objects of the experiment were to assess the value of an initial dressing of slowly available fertilisers, to compare the effects of mixed fertilisers of varying composition applied nine months after planting and to estimate the value of an application of manures just prior to fruiting. The experiment consisted of a six by six latin square. Each plot covered an area of 1/39th. of an acre and contained 236 plants. The fertiliser treatments applied at planting are shown in Table XXII.

TABLE XXII.
FERTILISER: LB. PER ACRE.

Treatment.	Cotton seed meal.	Rock phosphate.	Sulphate of Potash.
A	nil	nil	nil
B	1,400	250	180
C	1,400	250	180
D	1,400	250	180
E	1,400	250	180
F	1,400	250	180

After an interval of nine months certain of the plots received further applications of manures. The arrangements are shown in Table XXIII.

TABLE XXIII.
FERTILISER: LB. PER ACRE.

Treatment.	Sulphate of Ammonia.	Superphosphate.	Sulphate of Potash.	Iron Filings.
A	nil	nil	nil	nil
B	nil	nil	nil	nil
C	179	131	190	nil
D	250	184	266	nil
E	321	236	343	nil
F	250	184	266	19.5

Had the results of the pot experiment (paras. 38-40) been earlier available the second application would have been made at the end of six months in order to coincide with the considerable increase in rate of growth and nutrient uptake occurring at that period. At blossoming each plot will be divided into two half-plots and one of each of the subplots, randomly selected, will receive a further application of fertilisers.

OTHER WORK.

The Uptake of Nutrients by Pineapples.

38. The Assistant Chemist, Mr. C. L. C. Bourne, has, in addition to his general duties, commenced an investigation of the rate of uptake of ash constituents by pineapples. The object of the experiment was to obtain information regarding the composition and rate of application of fertilisers to pineapples grown on wallaba sand, the soil existing at the concessions of the local pineapple company. Twenty-four tubs were filled with wallaba sand obtained from the company's cultivation, Pln Charters. Uniform first suckers were planted in each tub during November, 1933 and three suckers, randomly selected, were separately analysed. The plants were given luxury dressings of complete fertiliser at various stages and at the end of every three months three plants, selected at random, were lifted, separately weighed, dried and sub-sampled for ash analyses. The mean results, so far obtained, are

presented in Tables XXIV. and XXV. It is not anticipated that the experiment will be concluded until the end of 1935.

TABLE XXIV.
ASH CONSTITUENTS PER CENT. OVEN DRY WEIGHT.

Date of collection.	20 11 33.	20.2.34.	28.5.34.	25.8.34.	23.11.34.	
					Leaves.	Roots.
Total ash (sulphated) ...	31.85	24.46	14.45	11.27	9.54	26.40
Silica-free ash ...	6.30	10.80	11.20	10.05	8.37	2.22
Nitrogen (N) ...	0.78	1.70	1.60	1.78	0.90	0.56
Silica (SiO ₂) ...	25.55	13.66	3.25	1.22	1.17	24.18
Phosphate (P ₂ O ₅) ...	0.52	1.11	1.16	1.01	0.61	0.09
Potash (K ₂ O) ...	1.32	3.71	4.47	4.33	3.15	0.56
Magnesia (MgO) ...	0.82	0.71	0.67	0.62	0.56	0.12
Lime (CaO) ...	0.74	1.04	0.60	0.53	0.68	0.36
Iron and alumina, etc. ...	0.33	0.15	0.08	0.07	0.14	0.19

TABLE XXV.
GMS. CONSTITUENTS PER HUNDRED FRESH PLANTS.

Date of collection.	20.11.33.	20.2.34.	28.5.34.	25.8.34.	23.11.34.
Total ash (sulphated) ...	427	311	403	1479	4139
Silica-free ash ...	84	133	310	1311	2730
Nitrogen (N) ...	10.5	21.1	44.5	232	304
Silica (SiO ₂) ...	343	178	93	159	1409
Phosphate (P ₂ O ₅) ...	6.8	13.6	31.8	132	199
Potash (K ₂ O) ...	17.7	45.3	122.4	564	1016
Magnesia (MgO) ...	11.2	8.9	18.6	81.3	184
Lime (CaO) ...	9.9	12.8	16.7	68.9	230
Iron and alumina, etc. ...	4.4	2.1	2.1	8.8	47.1
Fresh wt. of one pine, gms. ...	72.5	90.6	211.4	979.3	2502.1

39. The uptake of nitrogen, potash and phosphate stated as pounds per acre, with 10,000 plants to the acre, is shown in Table XXVI.

TABLE XXVI.
UPTAKE OF PLANT FOODS. LB. PER ACRE.

Date of sampling.	20.11.33.	20.2.34.	28.5.34.	25.8.34.	23.11.34.
Nitrogen (N) ...	2.3	4.6	9.8	51	67
Potash (K ₂ O) ...	3.9	10.0	27	124	224
Phosphate (P ₂ O ₅) ...	1.5	3.0	7.0	29	44

The plants were grown in wallaba sand, a white quartz sand consisting of about 98 per cent. silica and 2 per cent. organic matter. The soil is not likely to make much contribution to the nutrient supply of the plants.

40. A complete discussion of the experiment must await the collection of further results but it appears that for the first six months the growth and uptake of nutrients takes place slowly. Between the sixth and the ninth month there is a very considerable increase in growth and nutrient uptake. Between the ninth and the twelfth month the rates slacken. In a previous report (1933 p. 96) it was stated that the results of the first manurial trial with pineapples indicated that the crop required a high potash—low phosphate dressing. The results so far obtained in the pot experiment under consideration confirm this assumption. At the end of twelve months the plants contained the equivalent of 455 lb. per acre of sulphate of potash, 267 lb. per acre of superphosphate and 319 lb. per acre of sulphate of ammonia. The experiment will furnish information of considerable value in regard to the fertiliser requirements of pineapples.

The use of the Refractometer in the Pineapple Canning Factory.

41. During the year visits were paid to the concessions of the pineapple company and investigations were made concerning the assessment of the state of ripeness of the fruit by determinations of the degrees brix and/or the citric acid content of the juice and the use of the hypodermic needle for the determination of the degrees brix of the juice of the growing fruit. Observations were made regarding the general application of the refractometer to factory control.

42. In order to examine the possible connection between the brix and acidity of the juice and the ripeness of the fruit twenty-eight pines were tested on June 23, twenty-nine pines on June 26, and twenty-nine pines on August 24. All fruit was of the Smooth Cayenne variety.

The pines were cut open and placed in one of five arbitrary classes of ripeness as judged by appearance and taste. Each pine was then crushed in a food mincer and determinations of the refractometer brix and of the total acidity, expressed as a percentage of citric acid were made.

The results obtained in June were examined separately from those collected in August since the class of fruit differed considerably. The pineapples examined in June were slightly over-ripe, were larger and possessed a juice of high viscosity. The fruit tested in August, towards the end of the harvest, was small, slightly under-ripe and contained a juice of low viscosity. It was further noticed that in June considerable adjustment of the refractometer was required in order to overcome dispersion effects while no correction was necessary in August.

Correlation coefficients between the various factors involved were calculated and those for the first period appear in Table XXVII.

TABLE XXVII.

(JUNE 1934).

Variables.			No. of pairs.	Correlation coefficient.	Z	P
Ripeness and brix of juice	...	...	57	+0.3283	+0.3409	<0.02
Ripeness and % citric acid	...	...	57	-0.5816	-0.6648	<0.01
Ripeness and $\frac{\text{brix}}{\text{citric acid}}$ ratio	...	...	57	+0.6003	+0.6936	<0.01
% Citric acid and brix	...	...	57	-0.5735	-0.3926	<0.01

Difference in Z value required for significance (20 : 1)=0.3848.

The values for similar correlations during the second period are given in Table XXVIII.

TABLE XXVIII.

(AUGUST 1934).

Variables.			No. of pairs.	Correlation coefficient.	Z	P
Ripeness and brix of juice	...	...	29	+0.5463	+0.6131	<0.01
Ripeness and % citric acid	...	...	29	-0.0098	-0.0098	...
Ripeness and $\frac{\text{brix}}{\text{Citric acid}}$ ratio	...	...	29	+0.2939	+0.2029	>0.10
% Citric acid and brix	...	...	29	+0.1187	+0.1213	>0.10

Difference in Z value required for significance (20 : 1)=0.5250.

It will be seen from Table XXVII. that, as the ripeness of the fruit increases, the brix of the juice is augmented, the acidity decreases and the brix : citric acid ratio is increased. The values suggest that the association between ripeness and brix : citric acid ratio is stronger than that between ripeness and brix. The difference is, however, not statistically significant.

The regression equations derived from the data collected during June are appended, the ripeness mark, 3, being taken to indicate a desirable condition.

$$\text{Ripeness mark} = 0.214 \text{ Brix} + 1.15.$$

$$\text{Ripeness mark} = 6.41 - 3.38 \text{ C.}$$

$$\text{Ripeness mark} = 0.119 \frac{\text{B}}{\text{C}} + 1.76.$$

The regression equations derived from the data collected during August are appended:—

$$\text{Ripeness mark} = 0.232 \text{ Brix} - 0.35.$$

$$\text{Ripeness mark} = 4.28 - 0.887 \text{ C.}$$

$$\text{Ripeness mark} = 0.03905 \frac{\text{B}}{\text{C}} + 1.81.$$

The number of fruit falling into each ripeness class and the mean values for brix, % citric acid and brix: citric acid ratio are given in Table XXIX.

TABLE XXIX.

(JUNE 1934).

Ripeness class	...	1	2	3	4	5
No. of fruit	...	1	4	17	18	17
Mean brix of juice	...	10.8	10.6	12.2	12.8	12.7
Mean % citric acid in juice	...	0.790	0.950	0.884	0.757	0.620
Mean brix: citric acid ratio	...	13.7	11.2	13.8	16.9	20.5

(AUGUST 1934).

Ripeness class	...	2	3	4
No. of fruit	...	13	15	1
Mean brix of juice	...	11.9	13.2	14.6
Mean % citric acid in juice	...	0.662	0.645	0.700
Mean brix: citric acid ratio	...	18.0	20.5	20.9

In the June experiments the majority of the pineapples were either ripe, slightly over-ripe or very over-ripe.

In the August experiment the majority of the fruit were either slightly under-ripe or ripe. In the latter experiment the only association which is definitely demonstrated is between the brix of the juice and the ripeness mark.

The results so far obtained in connection with the first problem indicate that there is a definite, but somewhat weak, association between the ripeness of the fruit and the degrees brix of the expressed juice. As the fruit ripens the brix of the juice increases. It does not seem, however, from these results that the stage of ripeness can be predicted with any great certainty from measurements of the density of the juice.

In the first experiment the results indicated a definite association between the acidity of the juice and the state of ripeness. As ripening progressed the acidity of the juice diminished. It is doubtful, however, whether the ripeness could be accurately depicted by a measurement of the acidity of the juice. In the second experiment no such association is noted.

A definite association between the state of ripeness and the brix: citric acid ratio was obtained in the first experiment. No very definite forecast of the degree of ripeness can be obtained from the value for this ratio. In the second experiment no such association was demonstrated.

The fruit tested during the first experiment was a fair sample of the pineapples usually obtained at the concession while the fruit examined during the second experiment was undersized and unrepresentative. The results obtained in the first experiment should therefore carry greater weight.

It appears that, during the season under consideration, a ripe Smooth Cayenne pineapple yielded a juice of 12.2 degrees brix, containing 0.884% acid as citric acid and having a brix : citric acid ratio of 13.8.

43. The second problem, the use of the hypodermic needle for the determination of the degree brix of the juice of the growing fruit, was investigated during the first period only.

Juice was withdrawn from six different points on each of the fifty-seven pines examined during the June period.

The brix of each of the six samples was determined before the fruit was cut open. Points A and B were situated in the centre of the fruit, points C and D were taken in the upper half of the fruit while points E and F were situated in the lower half of the fruit.

The results obtained were correlated with the determinations of the brix of the composite juice collected on expression.

The values for the various correlation coefficient are shown in Table XXX.

TABLE XXX.

Variables.				Correlation coefficients.	Z.	P.
Composite brix and mean of	AB	...		+ 0.6997	+ 0.8667	<0.01
"	"	"	CD	+ 0.5619	+ 0.6357	<0.01
"	"	"	EF	+ 0.6911	+ 0.8500	<0.01
"	"	"	ABEF	+ 0.7674	+ 1.0139	<0.01

Difference in Z values required for significance (20:1) = 0.3848.

It will be seen that there is a definite correlation between the means of the various readings obtained by use of the needle and the composite brix. There is no definite difference in the strength of the associations indicated by the four coefficients and under these circumstances the mean of the brix readings of drops of juice withdrawn from points A and B might be used in order to forecast the brix of the composite juice. The regression equation of this connection is :—

Composite Brix = $7.0 + 0.613$ brix AB.

The original intention of the investigation was to examine the possibility of gauging the stage of ripeness by a determination of the brix of juice withdrawn by the needle. While the composite brix of the fruit may be estimated with fair accuracy by the examination of juice withdrawn by the needle yet the association found between composite brix and the state of ripeness is hardly strong enough to serve as a basis of a method of prediction.

The correlation coefficient found between the AB. brix and the state ripeness is +0.3634. The association is definitely proved but is of little value for the purposes of forecasting the degree of ripeness.

It should be remembered that all the fruit examined was of rather inferior quality due, probably, to the lack of correct fertiliser treatment. The experiments will be repeated when better fruit is available and it is hoped that more promising results will be obtained.

44. There is little doubt that the refractometer could be employed with considerable advantage in matters of factory control. Rapid determinations of the density of a large number of samples of the initial syrup are necessary, while the final cut-out density requires frequent measurements. The use of a spindle often requires too much material and for such purposes a refractometer would be admirably suited.

The use of the Refractometer as an aid to the Selection of Sugar-cane Seedlings.

45. During the period under review the Laboratory Assistant, Mr. L. A. Robinson, studied the problem of the use of the refractometer in the selection of sugar-cane seedlings bred at Sophia Experiment Station. Preliminary work was directed towards the rapid collection of representative samples of juice from separate stools. Trials were made with a cane piercer containing a storage test tube in the handle, but difficulties were experienced with the instrument. The method at present in use involves the employment of a corkborer. The main difficulty appears to be the collection of a sample which is representative of the juice of the stool and this point requires further investigation. In the meantime an approximate estimate of the sucrose content of the seedlings is obtained by use of the refractometer and is employed in conjunction with values for stool weights in the selection of seedling canes for field trial. 311 canes were examined in this manner during the year.

Tonka Beans.

46. The Assistant Chemist, Mr. C. L. C. Bourne, has compared the coumarin content of samples of local Tonka Beans with that of the Trinidad bean. The results obtained are presented in Table XXXI.

TABLE XXXI.
THE COUMARIN CONTENT OF TONKA BEANS.

	Per cent. Coumarin.
British Guiana bean, old collection ...	2.10
British Guiana bean, new collection ...	2.39
Trinidad bean ...	4.41

It will be seen that the Trinidad bean contains approximately twice as much coumarin as the British Guiana bean. In this respect the local bean appears to be similar to that obtained in Venezuela*. There was a considerable difference in appearance between the Trinidad and the local bean. The mean measurements given in Table XXXII. indicate this difference.

TABLE XXXII.

	British Guiana bean.	Trinidad bean.
Weight of one bean, gms. ...	1.974	2.475
Volume of one bean, ccs. ...	1.875	2.350
Specific gravity ...	1.052	1.052
Length of one bean, mms. ...	32.5	41.5
Width of one bean, mms. ...	16.0	13.2

The Trinidad bean is larger, longer and narrower than the British Guiana bean.

Mineral Constituents of Fodder Crops.

47. It was stated in a previous report (1933 p. 97) that monthly samples of pasturage collected by the Government Veterinary Surgeon were being examined regarding their contents of mineral constituents. The results of twelve monthly samples are given in Table XXXIII.

TABLE XXXIII.
PER CENT. OVEN DRY WEIGHT.

Sample.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
Date ...	3.8.33	12.9.33	3.10.33	13.11.33	4.12.33	4.1.34	6.2.34	9.3.34	4.4.34	11.5.34	5.6.34	4.7.34
Total ash ...	11.60	8.66	10.82	9.81	9.14	7.98	12.16	11.87	10.25	11.70	9.81	11.48
Silica-free ash ...	6.18	4.73	4.78	5.32	4.14	3.55	6.27	5.91	5.23	15.03	5.76	6.05
Silica ...	5.42	3.93	6.04	4.49	5.00	4.43	5.89	5.96	5.02	6.67	4.05	5.43
Sulphate (SO ₃) ...	0.61	0.61	0.78	0.47	0.28	0.11	0.57	0.66	0.69	0.73	0.83	0.63
Chloride (Cl) ...	0.47	0.69	0.63	0.43	0.39	0.60	0.64	0.65	0.61	0.54	0.67	0.80
Phosphate (P ₂ O ₅) ...	0.49	0.45	0.49	0.49	0.50	0.42	0.45	0.48	0.43	0.47	0.49	0.55
Nitrogen ...	1.19	1.18	1.28	1.37	1.31	1.04	1.51	1.12	1.23	1.67	1.54	1.46
Lime (CaO) ...	0.47	0.43	0.55	0.61	0.39	0.34	0.14	0.31	0.35	0.43	0.50	0.49
Magnesia (MgO) ...	0.64	0.64	0.68	0.63	0.65	0.47	0.67	0.64	0.73	0.66	0.69	0.57
Potash (K ₂ O) ...	1.03	1.49	1.34	1.30	1.16	0.86	1.29	1.18	1.52	1.23	1.84	1.74
Soda (Na ₂ O) ...	0.16	0.16	1.11	0.11	0.19	0.16	0.25	1.17	0.13	0.12	0.14	0.08
Iron oxide (Fe ₂ O ₃) ...	0.26	0.16	0.30	0.23	0.19	0.17	0.41	0.25	0.20	0.27	0.09	0.24

* Prof. F. Hardy. Private communication.

The silica-free ash content fluctuated considerably during the year and appeared to vary with the rainfall except during and immediately following a period of heavy precipitations. During this heavy weather the silica-free ash content decreased but showed a marked rise during the dry period immediately following the floods. The phosphate content was remarkably constant throughout the period and was uniformly lower than that of British natural pasturage. The nitrogen content varied noticeably during the year and was always very low. The lime content fluctuated during the year. It compared favourably with that of British natural pasturage during the months of October and November but dropped to a low value during the spell following the floods.

48. A sample of *Andropogon nodosus* submitted by the Government Veterinary Surgeon was examined in the laboratory and the results are presented in Table XXXIV. for record purposes.

TABLE XXXIV.
PER CENT. OVEN DRY WEIGHT.

Total ash	...	...	12.39
Silica-free ash	...	...	3.99
Silica (SiO_2)	...	...	8.40
Sulphate (SO_3)	...	...	0.17
Chloride (Cl)	...	...	0.57
Phosphate (P_2O_5)	...	...	0.47
Nitrogen	...	...	1.16
Lime (CaO)	...	...	0.26
Magnesia (MgO)	...	...	0.53
Potash (K_2O)	...	...	1.82
Soda (Na_2O)	...	...	0.02
Iron oxide (Fe_2O_3)	...	...	0.09

ACKNOWLEDGMENTS.

49. During the year the Division has received considerable help from the Imperial Bureau of Soil Science. In addition to monthly letters, lists of abstracts and other communications, the Division has received reprints of a number of interesting papers.

50. It is with great pleasure that I record my appreciation of the work of my colleagues, Mr. C. L. C. Bourne and Mr. L. A. Robinson during the period under review.

R. R. FOLLETT SMITH,
Chemist-Ecologist.

March 15, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE BOTANICAL AND MYCOLOGICAL DIVISION FOR
THE YEAR 1934.

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REPORT OF THE BOTANICAL AND MYCOLOGICAL DIVISION FOR THE YEAR 1934.

GENERAL.

The Botanist and Mycologist was granted four months' leave of absence and left the Colony on June 13. He resumed duty on November 14. While on leave he attended the Imperial Mycological Conference, held in London from September 17—22, as the Colony's representative.

2. At the end of August the Herbarium and Laboratory were transferred from the old quarters under the Director's house to the Department's new building. A certain amount of temporary disorganisation was caused by the move, and up to the end of the year the new laboratory still lacked water and electric wiring, which to some extent hampered pathological work.

DISEASES OF MAJOR CROPS.

Sugar Cane.

3. No serious disease of this crop was reported during the year. With further reference to the sprinkling apparatus mentioned in last year's report as being used for watering the dam beds on one of the larger estates in the Corentyne, the same estate has made a practice in recent years of making an additional application of Lime, at the rate of 2 tons per acre, to all dam beds of fields being replanted. There has been very little 'salt blight' on the estate in the past year, but whether liming or the use of the sprinkler is mainly responsible for this it is at present difficult to say.

Rice.

4. No serious disease of this crop has occurred during the period under review. Some minor occurrences of 'wind rice', or plants with 'light ears,' were reported from the West Coast, and said to be more prevalent along the line of former drains.

Coffee.

5. *Phloem Necrosis*.—A visit was paid to the North West District at the beginning of the year. The references to coffee made in the report for 1933 were in fact, expanded as a result of observations made at the beginning of 1934, and there is nothing further to add in this report.

6. *Flood damage to coffee*.—In March, a visit was paid to the Pomeroun District to investigate the damage caused to the coffee cultivation by the floods at the beginning of the year. After a long spell of wet weather in November and December, universal flooding took place as a result of the abnormal rains of January 6—8 and the farms on the river bank were flooded to a depth of several feet, the water remaining on the land for periods varying from 10 days to a fortnight. After the floods, a period of very dry weather immediately ensued. Towards the end of the period of inundation some of the coffee bushes began to show signs of yellowing, and a week or so after the water had gone off, the bushes everywhere began to dry up and die. (The symptoms appeared very similar to those accompanying acute *Phloem Necrosis*). The death of trees in this manner was still continuing at the time of my visit.

7. Examination of the roots of affected trees showed the root system of the majority to be very shallow. The prolonged flooding had seriously damaged the roots; but the hot dry period immediately after had probably done as much harm as the actual submergence. The demand for water in this ensuing dry period was more than the weakened roots could supply and wholesale wilting and death of the trees resulted. In one grant examined, older trees, on deep

pegasse, which had developed a deeper root system, had survived, whereas the younger trees had died out. The effects of the dry period after the flood were especially marked here, as clean cultivation was practised, and the topsoil soon became very hot and dry. One interesting case was observed here of two plants, growing together, the one dead and the other still apparently healthy. On digging them up and disentangling the roots, the dead tree was found only to possess a shallow surface rooting system, whereas the healthy tree had a tap root with a number of branches.

8. *Effect of Floods on other Trees.*—It was interesting to observe on some of the farms affected, that young Avocado Pear trees, which were deep rooted with a long tap root only, had died during the period of inundation, having doubtless been waterlogged through the wet months prior to the flood. Breadfruit trees also suffered seriously. Citrus trees on the other hand, with a better distributed root system, and more suited by nature to withstand extreme conditions, had in every instance survived, and mangoes were remarkable by the abnormally heavy crops borne by them throughout the colony after the floods, which apparently stimulated them to flower to an excessive degree.

Coconuts.

9. *Coconut Wilt.*—It is of interest to note that a farmer in the Pomeroon district reported that several of his trees, which appeared to be dying from wilt, recovered as a result of burning off all the outer leaves, so that only the heart leaves remained. The success of this somewhat drastic treatment has been reported in one or two other instances, and trees saved in this manner were observed some years ago on an estate on the East Bank. It is possible that the lowered demand for water, consequent upon removal of the greater part of the foliage, and the check to growth, may enable the trees to recover.

DISEASES OF MINOR CROPS.

Citrus.

10. A further outbreak of scab disease was reported as occurring in the citrus nursery at Hosororo at the end of the year. Spraying with Bordeaux mixture was carried out, and if necessary the seedlings will be shaded.

Plantains and Bananas.

11. *Moko Disease* was found affecting plantains and bananas at one or two places on the Essequibo River, and later in the year on the East Bank, Demerara River. The disease was seen on Cayenne, Giant Fig, Lady's Finger and Dwarf bananas, and on Maiden and Horse plantains. A detailed description of it was given in an article in Vol. V, No. 2 of the *Agricultural Journal*. The outbreak observed at the end of the year on the East Bank differed somewhat from those seen elsewhere, in that the leaf wilting symptoms were less marked than usual, and in some cases almost the first indication of the disease was the apparent premature ripening of some of the fingers in the green bunches. On cutting down such bunches the majority of the fruit was found to be rotten inside, and the typical symptoms were to be seen in the vascular bundles of the bunch stalk, and traced down the stem, though the vascular bundles of the outer pseudo-stem were unaffected.

12. '*Big Foot.*'—A few cases were observed on farms on the West Bank of a disease known to the farmers by this name, in which the 'pseudo-bulb' below ground grows abnormally bulky, and the pseudo-stem shows brown rotted areas and eventually collapses. Subsequently however the same stool may give rise to healthy plants. This disease was also referred to in the above mentioned article.

13. A rotting of banana fruits sent from Essequibo, and bruised in transit, was found to be associated with *Gloeosporium musarum*.

Cacao.

14. In response to a request for co-operation from the Trinidad Department of Agriculture, a search has been made for individual cacao trees which may appear resistant to Witch Broom Disease. The small areas which remain under cacao cultivation have for the most part been abandoned, or receive but scant attention, and Witch Broom is rife throughout them. The farmers who own the trees take little interest in them, and can give scarcely any information with regard to individual trees. The search therefore for immune trees becomes extremely difficult. A few trees were picked out as apparently free of disease, but most of these upon subsequent inspection were found to be infected. The majority of the cacao trees to be found in the colony now originated from seed obtained from Trinidad or Surinam. At Coomacka, on the Berbice River, some Criollo trees of great antiquity, planted by Dutch colonists, are to be found, but are all attacked by Witch Broom. Some wild cacao exists in the Kanaku Mountains in the Rupununi, which is at present free from the disease, but it is probable that if grown near a source of infection, it would succumb, like the wild cacao of Surinam.

Pineapples.

15. '*Browning*'.—A certain amount of Black Eye disease or '*Browning*' occurred at the new Pineapple Company's estate. More systematic counts were made however, at harvest, of the percentage of affected fruits, and the total, though liable to fluctuation, was found to be lower than before, and scarcely such as to affect the value of the crop.

16. '*Wilt*'.—Towards the end of the year a number of the pines on the Department's experimental area on the above estate showed symptoms entirely similar to those of the '*Wilt*' Disease described by Nowell, Stockdale, etc., as affecting this crop in the West Indies. The affected plants showed a discoloration of the leaves, beginning with a reddening and yellowing, followed by a browning and withering of the tips. On examination, though the heart of the plants was found still to be healthy, the roots were seen to be for the most part discoloured and dead. The occurrence of this condition may in part be attributed to the lack of attention which the cultivation has received during the latter part of the year.

Guavas.

17. '*Sun Crack*'.—A number of Guava fruits were sent in from the West Bank in April, affected by '*Sun Crack*.' This form of injury usually affects a certain percentage of ripening fruit, particularly when a wet spell is followed by several dry, sunny days. The fruits crack and split open, but are still serviceable for culinary purposes.

Tomatoes.

18. *Sclerotium rolfsii* was again observed attacking the '*collar*' and roots of a few wilting tomatoes at sub-station Cecilia.

Breadfruit.

19. A disease of young Breadfruit trees was inspected on the West Bank. The area concerned was rather over an acre in extent, and had been planted with a number of Breadfruit trees some 3 or 4 years previously. Nearly every tree was found to be dying back, and either leafless, or with only a few withering leaves remaining. The smaller branches were dried up and had died back to the main stem. In some instances brown patches were observed on the surface roots and near the collar. The disease was only brought to my notice shortly before my departure for leave, and its cause could not be ascertained. There were no visible symptoms however of attack by any of the more common root rotting fungi.

IMPERIAL MYCOLOGICAL INSTITUTE.

20. Thanks are again due to the Institute for determination of specimens and for advice and assistance given by them.

BOTANICAL INVESTIGATIONS.

Fish Poisons.

21. The Haiari cultivation trials in the North West District were inspected, and the more vigorous growth of both black and white varieties in the open than under shade was so marked that the abandonment of the shade cultivation was suggested. The White Haiari in the open at Wauna had become almost thick enough to keep down weeds, and it was noticeable here that the Black, which under similar conditions had not at first appeared so vigorous as the White, was now almost equal to it in rate of growth.

Jenman Herbarium.

22. The remounting and indexing of specimens has been continued, together with the general routine work of the Herbarium. The specimens of *Bignoniaceae* sent to Kew in 1933 have been returned, and the five hundred odd sheets also forwarded last year have been examined, and determinations made by Mr. Sandwith, to whom we are much indebted. This hitherto unnamed material has now been labelled and filed in the Herbarium cabinets. A number of sheets of Mosses sent to England in 1932 and subsequently named by Mr. P. W. Richards have also been returned.

Miscellaneous.

23. The Botanist and Mycologist visited the North West District in February to assist with the temporary settlement there of labourers rendered workless by reason of the January floods. A general tour of the district was made, in company with the Agricultural Instructor. In May he accompanied Mr. Dunlap, one of the United Fruit Company's representatives, on a tour of the Berbice River district, and also visited the Essequibo River with him and Mr. Sanderson, the other representative of the Company, and the Chemist-Ecologist.

24. Dr. W. A. Archer, Ph. D., of the United States Department of Agriculture visited the Colony in July and remained here until October. He was principally interested in the collection of Rotenone-producing plants, and in this connection made several expeditions to the North West District, the Forest Station, and other areas. He was afforded full facilities for carrying out his work in the Herbarium, and in addition the Herbarium Assistant accompanied him on one of his expeditions to the North West District. Dr. Archer presented duplicates of his various collections to the Department and a set of Herbarium material was set aside by him for despatch to Kew.

F. B. MARTYN,
Government Botanist and Mycologist.

January 25, 1935.

DEPARTMENT OF AGRICULTURE,

REPORT OF THE BOTANIC GARDENS FOR THE YEAR 1934.

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REPORT ON THE BOTANIC GARDENS FOR THE YEAR 1934.

GENERAL.

The Superintendent was absent on leave from June 13 to November 14.

2. At the beginning of the year very heavy rain was experienced, and on the night of January 7-8th a fall of 7.16" was recorded on the Gardens' gauge, as a result of which practically the whole Gardens, with the exception of the central avenue and a few raised areas, were put under water. The wind accompanying the heavy rain brought down two more of the old Oronoques in the avenue, and one or two smaller trees near them were damaged by their fall. After January however the rainfall for the year was below normal, except in October. The mid-year rains did not begin till late in June and there was but little rain at the end of the year. A comparison of the monthly rainfall at the Gardens with the means for the past 54 years is of interest.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Mean for 54 years (Inches)	7.63	5.47	5.83	6.25	11.15	11.63	10.10	6.59	3.47	2.64	5.57	12.05	88.38
1934 (Inches)	28.00	2.39	3.51	2.31	3.31	9.21	9.81	4.19	1.31	5.80	5.55	5.63	81.04

3. A further section of the old pipe line, passing through the nursery buildings and citrus nursery, was connected to the water supply. A new store was built by the Public Works Department to replace the old one which had become very dilapidated.

A Motor Mower was obtained at the end of the year. This has long been needed and will be of great value on the lawns of the Front Gardens and the new Head Office Compound.

4. The Illustrated Guide to the Botanic Gardens was printed in England and published at the end of the year.

5. The following table shows the amounts spent under the votes accorded to the Gardens. An over expenditure of \$100 was sanctioned for the Botanic Gardens Maintenance Vote, to cover the cost of the erection of the aviaries :—

	Vote.	Expenditure.
Botanic Gardens—Maintenance ...	\$ 4,500	\$ 4,599 30
Purchase, Production and Distribution of Seeds and Citrus Production ...	3,500	3,449 23
Upkeep of Government House and Public Buildings Gardens ...	1,400	1,397 14

FRONT GARDEN.

Aviaries.

6. The most notable addition to the Flower Garden was the erection of the aviaries near the Bandstand and the lakes. Two of the old iron cages from the Director's Compound were set up near the western end of No. 2 lake, and subsequently, at the instigation of His Excellency the Governor, a large aviary was built on the eastern side of No. 1 lake. In this latter was put a collection of small birds which had been got together by the late Mr. S. E. Gomes of Georgetown, and which was purchased from his widow. In the other cages were put a number of larger indigenous birds, Powis and Maroudies, obtained from Government House.

Beds and Borders.

7. The usual variety of herbaceous plants was maintained in the beds and parapets. In the beds outside the office Asters, Dahlias and Phlox all proved effective. Hollyhocks again did well in the herbaceous border on the Director's lawn, but Gladioli tried there were not so successful. *Barleria cristata* was used with success as an edging to several beds. A variety of Canna (Scheherazade) from Jamaica proved well suited to local conditions and was extended. A number of new plants were also introduced from Trinidad, with whom we exchanged a good many varieties. Window boxes were placed outside the office windows, and with Petunias, Torenias, Phlox etc., were a successful innovation. The *Vanda teres* set out in a special bed during the previous year could not be induced to flower and was taken out. The Bougainvillea received in 1933 from Trinidad and planted near the office proved, on flowering, to be "Master Norman" and not "Lady Walters."

8. The circular bed behind the bandstand was planted with *Allamanda cathartica*, which spread and covered the bed but was kept from straggling by clipping and gave a good massed effect. A number of plants of Carib Wood—*Sabinea carinalis*, were planted beside the path leading to No. 1 Island, the plants of *Erythrina crista-galli* having proved a failure there. A Ficus tree on No. 2 Island, by the iron bridge, died and had to be cut out, together with a quantity of creepers climbing on its branches. At the same time, a general clearance of the shrubberies on the island was made, preparatory to replanting.

9. When the mid-year rains came, a large number of plants were set out in the Front Gardens. These included several Eucalyptus spp. and others raised from seed received from Sydney, some new Palms, and one or two new introductions from Trinidad. At the end of the year, a further number of Palms received from Coconut Grove Arboretum, Florida, were put out. The new plantings in the Flower Garden included *Agave sisalana*, *Bauhinia*, spp., *Calliandra Guildingii*, *Cassia Grandis*, *Clerodendron Ugandense*, *Croton* spp., *Cuphea micropetala*, *Eucalyptus Bloxsonii*, *E. crebra*, *E. microcarys*, *E. robusta*, *E. stuartiana*, *Gliricidia maculata*, *Lagerstroemia Flos-Reginae*, *Plumeria* spp., *Poinciana regia*, *Triplaris suranimesis*, *Zamia pumila*, etc., and the following palms—*Actinorhynchus Calapparia*, *Arecastrum Romanzoffianum*, *Butia australis*, *Chamaedorea concolor*, *Chamaerops Humilis Argentea*, *Chrysalidocarpus decipiens*, *Livistona rotundifolia*, *Macrozamia Denuisonii*, *Ptychosperma sanderae*, *Roystonea floridana*, *Sabal mauritiformis*, *Scheelia excelsa*, *Thrinax barbadensis*, *Washingtonia Robusta*, *W. sonorae*.

PARK LANDS.

Avenue.

10. The remaining portion of the western end was surfaced with burnt earth. This completed the 'sheeting' of the whole Avenue. The road to the stables was repaired with granite in the worst places. As mentioned above, two more of the old Oronoques were blown down—one wholly, the other in part, during the storm on the night of January 7, and one or two other minor casualties occurred. Most of the plants lost were replaced, and nearly all the remaining gaps in the avenue were filled with new plants.

11. New plants in the avenue and park lands during the year also included a number of Eucalyptus and other seedlings raised from the seed received from Sydney. The following were planted out:—*Acacia melanoxydon*, *Acanthorrhiza aculeata*, *Angophora lanceolata*, *Brachychiton acerifolius*, *Calliandra Guildingii*, *Carica heptaphylla*, *Clerodendron ugandense*, *Cordia* sp., *Erythrina corallodendron*, *Eucalyptus botryoides*, *E. citriodora*, *E. corymbosa*, *E. melliodora*, *E. punctata*, *E. stuartiana*, *E. tereticornis*, *E. terminalis*, *Gliricidia maculata*, *Kopsia Fragrans*, *Lagerstroemia Flos-Reginae*, *Lysidice Rhodostegia*, *Lucuma mammosa*, *Plumeria acutifolia*, *Poinciana regia*, *Rheedia macrophylla*, *Washingtonia robusta*,

and a number of mixed shrubs, together with a plant sent from the interior under the Indian name 'Arisaru,' and another plant of *Monodora grandiflora* received from Trinidad to replace the young one that died in the previous year.

Apiary.

12. The shrubs and climbers at the Apiary are now well established and the whole makes a picturesque addition to the Park Lands.

HEAD OFFICE GROUNDS.

13. The new offices of the Department were built during the year on the piece of ground facing the Director's Garden on the Vlissengen Road. They were occupied in August. The area concerned was cleared of bush, *Antidesma*, and a number of old Oronoque stumps, and a start made to level the ground with a view to its being kept as a lawn and cut by machine. The whole area was fenced, and a beginning made to plant the *Hibiscus* hedge which is to encircle the area. A few shrubs were planted near the building, and a bed of Queen of Flowers and a border of *Barleria* established in front of the office. Water is laid on to the ground. A number of *Eucalyptus* and *Casuarina* seedlings were planted at the back of the building, and later it is intended to plant a few flowering trees and one or two specimens of *Ficus Benjaminia* on the lawns.

NURSERIES.

Ornamental Section.

14. *Water Supply*.—The pipe line passing through the nurseries was connected to the water main, enabling the plants to be watered quicker and more effectively.

15. *Orchids*.—A few additions were made to the collection of plants obtained by exchange. These included *Catasetum macrocarpum*, *C. sp.*, *Dendrobium Macarthaia*, *Epidendrum rigidum*, *E. sp.*, *Ionopsis sp.*, *Oncidium luridum*, *O. multiflorum*, *O. papilio*, *Vanda spathulata*.

16. One or more plants of the following orchids flowered during the year:—*Aerides crispum*, *A. multiflorum*, *A. odoratum*, *Angraecium eburneum*, *Aspasia epidendroides*, *Batemannia sp.*, *Bletia paetula*, *Bollea coelestis*, *Brassia caudata*, *B. Lawrenceana*, *B. sp.*, *Broughtonia sanguinea*, *Catasetum macrocarpum*, *C. scurra*, *C. viridiflorum*, *C. sp.*, *Cattleya Bouringiana*, *C. Deckerii*, *C. Jenmanii*, *C. labiata*, *C. labiata* vars. *Imperialis*, *Mossiae*, *Superba*, *trianae poppyanae*, *Warneri*, *C. Luddemaniana*, *Regina*, *C. Mossiae*, *C. Rex*, *C. Schroederiana*, *C. Skinneri*, *C. speciosissima*, *C. trianae*, *C. Warocqueana*, *C. sp.*, *Cymbidium pendulum*, *Dendrobium aggregatum majus*, *D. chrysotoxum*, *D. Gibsoni*, *D. Moschatum*, *D. phalaenopsis*, *D. Pierardii*, *D. Superbum*, *Diacrium bicornutum*, *Epidendrum ciliare*, *E. difforme*, *E. fragrans*, *E. osmanthus*, *E. variegatum*, *Gongora atropurpurea*, *G. maculata*, *G. nigrita*, *Hexisia bidentata*, *Miltonia spectabilis*, *Oncidium altissimum*, *O. Lanceanum*, *Phalaenopsis amabilis*, *P. esmeralda Regnerii*, *P. Stuartiana*, *Renanthera coccinea*, *Rodriguezia secunda*, *Sobralia panamensis*, *Stanhopea bucephalis*, *S. eburnea*, *S. Wardii*, *Trigonidium seemanii*.

17. *Seedling Troughs*.—A double row of seed troughs was made, to the east of the Glass House, and roofed with a frame on which iron sheets can be placed when shelter is needed, and quickly and easily removed when rain is over. The raising of seedlings of all kinds will be simplified by this structure.

18. *Introductions*.—A number of plants have been received by exchange from Trinidad during the year. These include:—*Adiantum macrophyllum*, *Ananas Sativa* var. *variegata*, *Anthurium andreanum*, *Asplenium cristatum*, *Bassia latifolia*, *Bignonia venusta*, *Bougainvillea* 'Helen McLean,' *Bougainvillea* 'Lady Wilson' *Clerodendron Ugandense*, *Cuphea micropetala*, *Dichorisandra thyrsiflora*, *Hibiscus waianae*, *Hibiscus* var. *sunset*, *Ixora hybrid*, *Jatropha multifida*, *Monodora*

grandiflora, *Poinsettia pulcherrima* (White variety), *Pseuderanthymum seticalyx*, *Richardia africana*.

19. *Palms*.—In addition, the following palm plants were received from the Coconut Grove Arboretum, Florida :—*Actinorhynchus calapparia*, *Areca sapida*, *Arenga mindorensis*, *Butia australis*, *B. capitata æripspatha*, *Chamaedorea concolor*, *Chrysalidocarpus decipiens*, *Chamaerops humilis arborescens*, *C. humilis argentea*, *C. humilis elegans*, *C. humilis macrocarpa*, *Erythea edulis*, *Gaussia princeps*, *Glaucotea armata*, *Ptychosperma sanderae*, *Roystonea floridana*, *Sabal yapa*, *Thrinax barbadensis*, *T. radiata*, *Trachycarpus excelsa*, *Washingtonia sonora*, the *Cycads*, *Macrozamia dennisonii* and *Zamia pumila*. Also, a further large selection of palm seed was received from Captain H. A. Johnstone.

20. A quantity of seed was received from Sydney Botanic Gardens at the beginning of the year, including a large number of species of *Acacia*, and *Eucalyptus* and many other species as well—74 in all.

21. *Double Coconuts*.—Three double coconuts, *Lodoicea Maldivica*, which had been bedded in the nursery two years before, germinated, one sending up a plumule which first drew attention to them, the others only producing a root. A very long root had been formed by all of them, which made lifting difficult. All three however were taken up and planted near the No. 2 lake, in the northern section of the flower garden. The nut which had already produced a shoot has established itself and the young palm is growing ; no plumule has appeared as yet however from the other two.

22. *Rockery*.—The bed at the western end of the nursery was cleared of a meaningless mass of shrubs and stones and laid out afresh as a shaded rockery by the Horticultural Assistant. Planted with Balsams, Ferns, Caladiums and other Aroids, etc., it has made a very striking addition to the nursery.

Economic Section.

23. *Citrus*.—The new section of pipe line connected to the watering system enabled the southern section (No. 2) of the citrus nursery to be watered by hose. Budded plants in this section were lifted during the year, and the beds as they became clear planted with Bengal Bean. The northern section (No. 1) which had been rested was planted up again with sour orange seedlings in the latter part of the year. During the year 980 stocks were budded and 1,686 plants lifted and basketed. Budwood was again obtained from the Trinidad Department of Agriculture, who responded to every request most generously. Buds were also again selected from good local seedlings. The Department's citrus orchard at Hosororo has now reached a stage when we may hope to be able to obtain a part at least of our budwood requirements from our own resources.

24. The following table shows the distribution of budded citrus during the year to all districts excepting the North West District. (See also Tables I. and II., page 116).

TABLE A.
DISTRIBUTION OF BUDDED ORANGE, GRAPEFRUIT AND SHADDOCK TO THE UNDERMENTIONED DISTRICTS.

	East Coast.	West Coast.	East Bank.	West Bank.	Demerara River.	Berbice.	Essequibo.	Georgetown.	Total.
Budded orange ...	86	5	158	69	13	51	534	32	948
Budded grapefruit ...	182	1	112	46	...	66	245	12	664
Shaddock ...	...	...	...	...	...	...	2	1	3
	268	6	270	115	13	117	781	45	1,615

25. Arrangements have now been made whereby two or three individuals, who wish to cultivate citrus on a fairly large scale, have started their own

nurseries, the Department rendering every assistance with the layout and planting of the nursery, and later with budding of the seedlings. The Gardens nurseries will serve in future to supply plants for those placing small orders, and as the demands on it become less, it will be possible to keep plants in the nursery for rather longer and attend to the topping and shaping of the trees there, rather than leaving this to be done after the young trees have been planted out by the purchasers, as has been the practice hitherto.

26. Small areas were chosen during the year at Pln. Haags Bosche (East Bank), Pln. Letter T (E.C. Demerara), and Onderneeming (Essequibo), on which it was proposed to plant experimental citrus blocks, the plants to be supplied by the Department as they become available, but planted and maintained by the proprietors of the land. Such an area had already been laid out at Pln. Blairmont, Berbice.

27. The following plants were received, through Dr. W. A. Archer, from the United States Department of Agriculture:—Tangelos of the varieties 'Thornton,' 'Lake,' 'Seminole,' 'Altoona,' 'Clement,' and 'Minneola,' also *Citropsis schweinfurthii*, *Murraya exotica*, and *Swingleii glutinosa*. These were subsequently sent to Hosororo station in the North West District. In addition, seed was received from Ceylon of a variety of Lime known there as 'British Guiana,' but of which the exact origin is somewhat uncertain. It is reported to be a heavy bearer.

28. *Mangoes*.—The trees in the nursery, in common with the mango trees throughout the colony, bore a heavy crop of fruit after the floods. Later in the year grafting was carried out to fulfil orders for plants and 84 grafted plants were basketed and ready for delivery before the end of the year. Small trial shipments of Julie and Buxton Spice mangoes were made to Canada during the year—one crate being sent in each case, in which the fruits were packed in separate compartments. Favourable reports were sent by the recipients. Plants of the varieties 'Lorieau,' 'Divine,' 'Cambodiana,' 'Totofera' (or 'Gordon'), 'Cherie,' and 'Peters' (or 'Bombay') were received from the Dominica Department of Agriculture and subsequently planted out at the Experiment Station. Further attempts at topworking mangoes again met with no success. The cover of *Dolichos hosei* established on the mango beds proved unable to dominate the grass and other weeds.

29. *Yams*.—Tubers of the following varieties were received from the Imperial College of Tropical Agriculture: 'Lisbon,' 'Bottle neck Lisbon,' 'Horn,' 'Yellow,' 'Guinea,' 'Ebu' and 'Chinese.' These were set out in the old cane quarantine bed (which had been handed over to the Gardens by Sophia at the beginning of the year). Though the 'Chinese Yam' proved prolific, none of the varieties did very well in the Garden's soil, and it was decided to send them to the North West District for trial on pegasse.

30. *Other Introductions*.—A few seeds of Christophene (*Sechium edule*) were obtained from Trinidad and germinated, but the plants died later. Seed of *Achras Zapota* were obtained from the Philippine Islands and seedlings successfully raised. Seed of *Aleurites montana* was received from Kew and a few seedlings have been raised and despatched to Hosororo. Dr. Archer of the United States Department of Agriculture, who visited the colony in connection with the study of plants used as Fish Poisons, made several collections in the North West District and other areas, and brought back a large quantity of seed, cuttings etc., of Fish Poisons and other plants. These were planted out in the nursery, and despite some failures, yielded an interesting collection. The I.C. 2 and Giant Cavendish Bananas received during the previous year from the Imperial College of Tropical Agriculture fruited during the year, though the bunches obtained were rather poor. As suckers developed, the stools have been divided up and extended.

31. *Vegetables and Ginger.*—Some good crops of onions and ‘Early market’ tomatoes were obtained during the year, this latter variety proving much the most suitable for cultivation in the nursery. The ginger received from Dominica in the previous year and planted in the nursery made very poor growth, and a few rhizomes of Jamaica ginger that had been obtained were only kept alive by putting them in pots.

TABLES.

32. The following tables indicate the general activities of the Gardens during the year :—

TABLE I.

Plants put out in the Gardens	{ On parapets	...	...	22,195
	{ Shrubs, trees, etc.	...	...	410
Plants basketed and potted	{ Ornamental	...	...	6,845
	{ Economic (except citrus)	...	...	3,794
Plants ringed, layered and grafted	...	...	...	1,370
Seed sown	{ Ornamental (other than packets)	...	...	198
	{ Economic (other than citrus)	...	...	8,914
	{ Seed sown	...	...	19,909
	{ Seedlings bedded out	...	...	5,065
Citrus	{ Seedlings Budded	...	...	980
	{ Plants basketed	...	...	1,686

TABLE II.

PLANTS SOLD AND DISTRIBUTED DURING THE YEAR 1934.

Economic Section.				Ornamental Section.			
Budded Grapefruit—				Begoniaa	...	...	75
Duncan	...	...	70	Crotons	...	...	26
Foster	...	...	153	Hibiscus	...	...	19
Marsh	...	...	315	Ferns	...	...	226
Walters	...	...	126	Palms	...	...	686
Budded Orange—				Bamboo (bundles)	...	...	224
Jaffa	...	...	147	Miscellaneous	...	...	563
King	...	...	3				
Haags Bosche (local)	...	...	378				1,819
Homas-asa	...	...	5				
Majorca	...	...	4				
Parson Brown	...	...	120				
Ruby	...	...	30				
Satsuma	...	...	25				
St. Michael	...	...	42				
Valencia	...	...	138				
West Bank (local)	...	...	56				
Shaddock	...	...	3				
Grafted Mangoes	...	...	41				
“ Pears	...	...	13				
Cacao Seedlings	...	...	434				
Coffee	...	...	500				
Other economics	...	...	1,469				
			4,072				

TABLE III.

STATEMENT OF REVENUE RECEIVED FOR 1934.

Months.	Sale of Plants.	Hire of Plants.	Sale of Pots.	Sale of Bamboo.	Sale of Lillies.	Miscellaneous.	Total.
January	\$ 27 12	\$ 3 08	...	\$ 1 08	...	...	\$ 31 28
February	21 60	64	...	3 50	\$ 48	...	26 22
March	42 10	48	\$ 4 20	1 37	1 36	\$ 40	49 91
April	43 81	1 68	2 10	72	84	1 20	50 35
May	28 00	...	...	4 21	4 32	36	36 89
June	33 04	...	...	1 80	2 36	...	37 20
July	32 72	64	4 88	2 76	2 90	24	44 14
August	23 45	...	32	1 28	64	...	25 89
September	27 02	...	...	1 36	78	...	26 16
October	29 04	...	...	1 57	3 01	9 04	42 66
November	46 13	...	...	2 40	72	35	49 61
December	59 56	2 70	20	5 48	1 38	24	69 56
Total	\$ 413 79	\$ 9 22	\$ 11 70	\$ 27 53	\$ 18 79	\$ 11 84	\$ 492 87

APPRENTICES.

33. There were seven apprentices employed during the year, one of whom was absent during the latter six months owing to illness. It is arranged that during their two-year period of apprenticeship the boys spend part of their time in turn at the Nursery, the Rice Station, the Livestock Farm, the Sugar Experiment Station and the Apiary.

GOVERNMENT HOUSE AND PUBLIC BUILDINGS.

34. These Gardens have been maintained in order during the year. The English roses planted in 1932 in tubs at Government House have failed one by one, but some good Dahlias have replaced them. Two trees of *Cassia fistula* planted at the western end of the lawns died. This is a difficult tree to establish locally. The lawns were maintained in good order. The Hibiscus hedge at the eastern end of the north lawn was continued along the Carmichael Street border. The Mango tree on the lawn opposite the front door bore a phenomenal crop of fruit in April, but it is not of very good quality. The vegetable garden at Government House was kept well supplied throughout the year.

E. B. MARTYN,
Superintendent, Botanic Gardens.

January 25, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE ENTOMOLOGICAL DIVISION FOR THE YEAR 1934.

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ANNUAL REPORT OF THE ENTOMOLOGICAL DIVISION FOR 1934.

GENERAL.

The year 1934 was one of exceptional freedom from outbreaks of insect pests. Apart from the small moth-borer of sugar-cane which forms the subject of a special investigation all the major pests of the colony were quiescent. Chronic pests such as the rice weevil and "coushi" or parasolants continued to take their usual toll and there was some loss caused by sporadic outbreaks of truck crop pests. Following shortly after the floods of January there was a plague of army worms, *Laphygma* sp. on pasture lands and garden crops, at the mouth of the Moruca river, and in isolated and widely separated areas along the coast of the provinces of Demerara and Essequibo. Fortunately, the attacks did not last long but died out within a week or two in most cases. The moths were fairly active and were frequently observed in houses so that it is probable that they covered considerable distances in the field and were partly responsible for the widespread character of the outbreak though the simultaneousness of the different eruptions indicates that the Noctuid was already pretty well distributed.

2. In discussing the various insects of economic importance special mention will be made under the appropriate heading of each in turn even if it be only to record its absence during the year, for such negative information may be gathered up in time and will serve to throw light on such important entomological questions as periodicity, and the influence of weather and seasonal changes on the incidence of insects.

PRINCIPAL CROP PESTS.

Sugar-cane.

3. The Dynastids *Dyscinetus geminatus* F., and *Dyscinetus bidentatus* Burm, the large and small "hardbacks" respectively, which periodically do great damage in young cane fields by attacking the eyes of the cane setts or tops and the young shoots were not recorded from the sugar estates during the year. This respite is attributable to the abnormally heavy rainfall in January which killed off large numbers of young larvae. There is a peak in this phase of the insect's life-cycle just about at this time. In 1933 as recorded in the Division's report for that year copious rains on March 20-21 resulted in a severe mortality of advanced larvae which were brought up from the ground and left strewn around dead in conspicuous numbers. By watching the rainfall closely and noting especially the occurrence of heavy downpours during the dry season when the larval stage is at its height, it ought to be possible to predict periods of danger. Moreover, the subterranean habits and breeding places of the beetles are still only very imperfectly known. When the essential character of these breeding grounds is understood it may be possible to demarcate and flood them at the right time with considerable controlling effect. In the environs of Georgetown, some of the favourite breeding grounds are well known. They are low lying grass lands fairly rich in humus.

4. Samples of earth were removed from a particularly rich 'pocket' of hard-back larvae found near the edge of a pond and in close proximity to a mouldering tree stump. The larvae were permitted to feed until a good portion of the earth had been consumed and reduced to frass when the latter was collected and analysed together with samples of the food. This was done by the Chemist-Ecologist who reported as follows:—

" Food.			
Moisture	...	35.86	%
Carbon	...	18.47	,,
Organic matter	...	31.82	,,
Frass.			
Moisture	...	29.42	,,
Carbon	..	6.43	,,
Organic matter	...	11.08	,,

The figures for organic matter were obtained by multiplying the carbon figures by the conventional factor of 1.72." It will be seen from these figures that the nutritional requirements of the beetles are such that their breeding grounds would be naturally limited, a fact that is well borne out by direct observation.

5. The yellow sugar cane aphid *Rhopalosiphum sacchari* Zenht previously recorded as *Sipha flava* Forbes was of little importance during the year—no outbreak having been reported from the estates. This insect turns up as a rule in the height of the rainy seasons and in cases where severe attacks occur on young plants the growth may be seriously retarded. The absence of this pest was probably due to the low and unevenly distributed rainfall. The figure for the year was only 31.04 inches, with 28 inches in January, during which flood conditions obtained—not greatly favourable to insect life. The wet months of June and December had only 9.21 and 5.63 inches respectively both of which figures are well below the average. No other food-plant has yet been found and only the winged and apterous parthenogenic viviparous forms are known. The alate cast makes its appearance in crowded populations. There are several predacious enemies of the aphid all of which have been mentioned in previous reports. By far the most active of them is a coccinellid *Neda sanguinea* L. which, however, does not appear to thrive in the cane fields during the very damp weather when conditions favour the aphid most. There are no parasites. Bad drainage does not appear to have any bearing on aphid attacks.

6. An experiment was laid down in this connection. Several plots surrounded by drains of different depths were planted out. Up to the end of the first ratoon several mild attacks of the aphid occurred—the well drained plots shewing if anything a greater susceptibility.

Rice.

7. The rice weevil investigation was continued—the main line of research being the use of adulterants in the rice to ward off attack. The results of this work were published in the Agricultural Journal of British Guiana, March 1935. The general conclusion arrived at was that both Calcium carbonate used at the rate of 1 lb. per 180 lb. of rice and Sodium fluor-silicate at the rate of 0.07 per cent. by weight give an economic control of the rice weevil for at least 8 months. The Calcium carbonate is recommended in preference to the Sodium fluor-silicate treatment.

8. Neither of the padi stem borers has caused any severe damage. The parasites of *Diatraea* are already well known. *Scirpophaga* has a larval parasite *Hecabolus* sp. and a very active egg parasite which has not yet been determined.

Pineapples.

9. *Wilt disease of pineapples*.—A wilt disease of pineapples reported from the British Guiana Fruit and Canning Company's plantation at Dalgin was investigated. The whole plantation of some twenty acres was affected in patches which stood out clearly from the surrounding healthy plants by reason of the striking symptoms of the disease. The leaves turn bright brick red from the bottom of the plant upwards and wilt from the top to the base of the leaves. From observations, there was no reason to suspect mealy-bugs as being implicated though these were present in large numbers on the leaf bases of some of the plants.

10. The Lycaenid *Tmolus echion* Butl. remains a rare pest of pineapples. The larva eats its way into the receptacle just when the corolla is being extruded through the sepals. The injury to the fruits is considerable but the number of fruits attacked is negligible.

11. The Pineapple bug *Athaumastus laetus* Mayr. formerly only recorded on the coastlands, has made its appearance at the Pineapple cultivation at Dalgin, Demerara River, having been first found on plants growing near and around the habitations on the plantation. The egg parasite *Hadronotus rugosithorax* Ashm. arrived

with its host and is very active. Some eggs collected there showed 93 per cent. parasitism.

Coconuts.

12. There were several slight outbreaks of the coconut butterfly *Brassolis sophorae* L. in Georgetown and on parts of the East Coast of Demerara, but these were short lived and of little importance. Small collecting gangs were maintained during these attacks by a few of the coconut estates.

13. The Dynastid *Strategus aloeus* Fabr. did not attract much attention during the year and was evidently scarcer than usual. Control measures are simple, but routine inspection of young trees is necessary.

OTHER PESTS.

14. A wide-spread and severe outbreak of the Chrysomelid *Colaspis hypochlora* Lefèv. occurred on the coastal belt of the province of Demerara. Its favourite food-plant is the plantain. It attacks the foliage particularly the young leaf when it is rolled up, eating its way into the roll and burrowing through the compact tissues so that the leaf on unfurling has a very tattered appearance. The floral parts are also attacked but the most noticeable damage is done to the fruits which are attacked in all stages. Early and severe injury may reduce the size of the "finger" but the principal damage is the disfigurement due to the resulting black scars which reduces the market value of the fruit. A prolonged search was made for the immature forms which have been recorded by Salt in North Eastern Colombia (Bull. Ent. Res. Vol. XIX., p. 295) as living among the roots of wild grasses but without success. The conclusion arrived at was that the young stages were not present in the plantain fields but that the adults migrated there from other areas. Protective sprays were recommended but fortunately in every locality the outbreak rapidly subsided—lasting in no case longer than 3 to 4 weeks. The beetle is indigenous and has no doubt long been associated with plantains and the other food plants mentioned but hitherto its ravages have not apparently been serious enough to attract much attention. The only natural enemies observed were birds and lizards.

15. Coushi or parasol ants, *Atta octospinosa* Reich. *A. cephalotes* L., *A. jervena* Say and *A. laevigata* Smith all occur locally and are particularly destructive to truck crops. The pest is extremely difficult to control in the sandy regions of the interior where the soil does not hold gases very well.

16. A Scolytid which has not yet been determined was found attacking British Honduras Mahogany trees in the North West District where there is a small plantation of this species. The insect breeds in the bark and is so numerous that when emergence takes place the trunk and the larger branches are covered with holes at the rate of about 15 to the square inch. Six trees were attacked and all of these died. The larvae of the beetle are parasitised by *Chaetospila elegans* Wetsw. the well known parasite of the rice weevil. Several West Indian Mahogany trees growing wild in the bush nearby were found similarly attacked.

17. A beetle destroying trouser buttons was reported by a local commercial agent. This proved to be the Scolytid *Coccotrypes dactyliperda* F. This species breeds in the buttons leaving only a thin outer shell. These buttons are made from the Doum nut palm (*Hyphaene*) a product of the Sudan.

18. An outbreak of the Hesperiid *Pyrrhopyge amyclas* Cram. which attacks and defoliates guava trees was recorded.

MISCELLANEOUS.

19. *Publications.*—The following were published during the year.

The Coconut Caterpillar (in collaboration with L. D. Cleare, F.R.E.S., F.L.S.)
Agricultural Journal of British Guiana, Vol. V, No. 3, September 1934.

A Study of the padi bug, *Mormidea poecila* Dall., Agricultural Journal of British Guiana, Vol. V, No. 4, December 1934.

A plague of Caterpillars—Press Notes
The Padi Bug —Press Notes

20. *The Collection*.—A good many insects were added to the general collection. A list was published in the Agricultural Journal of British Guiana, June, 1935.

21. *Acknowledgments*.—I take this opportunity of acknowledging with gratitude the generous and very able support given by my assistants Messrs. C. Williams and W. V. Armoogan throughout the year in every undertaking of the Division.

F. A. SQUIRE,
Supernumerary Entomologist.

April 30, 1935.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE VETERINARY DIVISION FOR THE YEAR 1934.

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REPORT OF THE VETERINARY DIVISION FOR THE YEAR, 1934.

GENERAL.

Imported animals were inspected on arrival on the wharves. Routine visits were made to the Stock Farm and Police Stables. On November 3, the Government Veterinary Surgeon proceeded to the Rupununi with the Commissioners appointed by the League of Nations for the settlement of Assyrians. Mr. A. M. Fulton, B.Sc., M.R.C.V.S., D.V.H. acted as Government Veterinary Surgeon from November 3.

2. At the beginning of the year the floods caused heavy losses of live-stock in the coast districts. Efforts were made to save the animals by removing them from the flooded areas by road and rail. The response to a call for assistance was immediate, the land-owners, race clubs, and all sports clubs of Georgetown generously placed their lands at the disposal of Government. Fences were hastily erected and accommodation was found for approximately 2,000 head of cattle, horses and mules. The municipality of Georgetown placed lorries and men at the disposal of the Government for the purpose of clearing the grazing areas of carcasses of animals which had perished. The Deputy Mayor, the Honourable Nelson Cannon, and Mr. H. A. Fraser, B.V.Sc., Veterinary Surgeon, rendered valuable assistance in supervising the removal of animals and clearing grazing areas.

Cattle.

3. Although the flood caused heavy losses of cattle in the flooded areas there is no appreciable difference in the numbers kept near the city and the larger villages. The drought which followed the flood and prevented the cultivation of agricultural land greatly increased the areas available for grazing. Generally, the cattle of the coast show better condition this year than they have done at any time during the past six years. This is ocular proof of the fact that the coast lands are eminently suitable for livestock, and that in normal years the miserable condition exhibited is due to starvation caused by overstocking. In the coming year if weather conditions are normal the agricultural land will be again cultivated, and unless steps are taken by the stock-owners to find grazing farther afield, the cattle will suffer from starvation due to overstocking, and again exhibit the miserable condition which is considered normal for the coast cattle. And if a drought occurs when the lands are under cultivation the plight of the live-stock will be serious.

4. The progress made by the dairy farmers during recent years, by feeding supplementary rations in the form of concentrates, has received a severe check due to the failure of the supply of local foodstuffs. It is evident that a regular supply of locally grown foodstuffs cannot be obtained at economic prices, and imported meals are too costly. Under these conditions dairy farmers are faced with the problem of providing improved pasture and increasing the supply of forage. It has been demonstrated that the pasture can be improved and the supply of forage greatly increased on small areas, but it is very doubtful that sufficient land is available near dairy stables for the amount of grass and forage required. The only practical solution for dairy farmers in congested areas is to eliminate all poor milkers and transfer all oxen, dry cows, and young stock to grazing areas farther afield.

5. *Markets for Cattle.*—The local markets are offered a supply greater than the demand, and the prices are low. From time to time small consignments of slaughter cattle have been despatched to Trinidad. These cattle were not the best that can be produced in the Colony, and are not a good advertisement. Most stock-owners are agriculturists and if their cattle had been of good type suitable for export the sale of such animals would have tided them over the period of distress when the lands could not be cultivated. Cattle on the coast will remain of doubtful value until their owners improve the breed and provide ample food at all times.

6. *Improvement of Breed.*—The live-stock vote is a small one and is sufficient for the maintenance of a few animals only. The funds available for the purchase of

cattle have been expended over milk breeds. The distribution of these bulls to the best advantage is confined to areas near the largest markets. Many applications for Government Bulls to be stationed in districts far distant from milk markets are received by the Department. Under this pressure a few bulls have been sent to the out-districts. The results have been unsatisfactory. In most cases the half-bred progeny have not been properly reared and many have died. The system of cattle-management is different from that practised in the milk centres, and is not suitable for milk-breeds. That there is an urgent need for bulls of improved breed in the out-districts is acknowledged, but unless the vote for live-stock is increased suitable animals cannot be supplied.

Sheep and Goats.

7. A few goats of milk-breed have been imported. These animals do well and are to be recommended as substitutes for cows in congested areas. The ordinary sheep and goats continue to increase in numbers and apparently meet the requirements for mutton.

Swine.

8. There is a steady increase and improvement of quality. Very much more might be done with these animals if a few stock-owners specialised in keeping them in suitable surroundings.

Poultry.

9. The size of egg and quality of table bird show improvement, which, however, would be much more rapid if poultry keepers kept to one breed for cockerels.

ANIMAL HEALTH.

Anthrax.

10. The death of a mule in Essequibo, suspected of Anthrax, was reported. The suspicion was corroborated, and the remainder of the animals inoculated without delay. No further deaths occurred.

Mal de Caderas.

11. This disease which has been prevalent in the Rupununi for the past three years has caused heavy losses amongst equines. Advice as regards control and treatment was given to ranchers concerned but no action taken by them. Three horses coming over the trail were found to be infected. Two were advanced cases and died, the third was treated by the owner, as advised, and recovered.

Tuberculosis.

12. A high percentage of exported animals were found to be affected with this disease. All the exported animals were from Berbice.

Control of Animal Diseases.

13. There are no live-stock regulations and the position of the Government Veterinary Surgeon is merely advisory. Stock-owners accept advice offered if it suits their convenience or purpose, otherwise they ignore it.

GOVERNMENT STOCK.

Distribution of Stock.

14. At the end of the year the number and distribution of the breeding animals and feathered stock was as follows :—

CATTLE.

Georgetown—

- (a) Male —3 Holstein—Friesian bulls.
2 Young Holstein—Friesian bulls imported.
2 Bull calves Holstein-Friesian.
1 Guernsey bull.
1 Guernsey bull calf—obtained by exchange.
- (b) Female—3 Holstein-Friesian cows.
1 Holstein-Friesian heifer calf.

Georgetown—

SWINE.

- (a) 5 Breeding Sows.
 (b) 1 Boar.
 (c) 19 Young Stock.

POULTRY.

- 5 Breeding Pens.

Leguan—

- 1 Guernsey Bull.
 2 Pen Poultry.
 1 Jack Donkey.

Onderneeming—

- 1 Holstein-Friesian bull.
 1 Trio pig.

Forest Station—

- 1 Holstein-Friesian bull.

East Demerara—

- 1 Holstein-Friesian bull.

15. Sales.—The following were sold during the year :—

<i>Cattle</i>	...	...	2 cows 7 heifers—9
<i>Swine</i>	...	...	44 young stock and 1 boar—45
<i>Poultry</i>	...	...	247 young stock, 2,872 eggs

Breeding Stations.

16. Breeding Stations were established at Georgetown, Leguan, Essequibo, Mazaruni, East Demerara and Berbice, during the year. A special vote of \$300 was granted for the purpose of establishing a breeding centre at Leguan. One bull, one Jack donkey and two pens of poultry were sent to the island. The bull and poultry proved a success, but little use has been made of the donkey. Guatemala grass and Demerara Primrose were established at this centre for the purpose of feeding to stock and the distribution of plants to farmers in the island. A trio of pigs were sent to Onderneeming. The bull at this Station is used for the herd of cows kept by the school but is not used by local farmers for their cows. The bull stationed at Anna Regina, was not used by the local farmers and was transferred to East Demerara. A bull was sent to the Forest Station, Mazaruni, for the purpose of breeding milk animals for the supply of milk to the station and Bartica. The Forestry Department have established guatemala grass at this station. The demand for the services of a Government bull at New Amsterdam ceased and the bull was transferred to Georgetown. A number of cockerels and pullets were distributed to farmers in Leguan and Wakenaam at nominal prices.

MISCELLANEOUS.

Fodder Plants and Grasses.

17. The Georgetown Station has distributed large quantities of guatemala grass to farmers in the district, and packets of seed of Demerara Primrose, *Phaseolus semi-erectus*, *Andropogon nodosus*, Wynne grass, and *Paspalum dilatatum* have been despatched to farmers and the cattle trail for trial. Experiments have been carried out with four varieties of *Lespedeza* obtained from the United States of America. The perennial variety, *Lespedeza sericea*, was established, but the other three varieties failed. Samples of *Paspalum dilatatum* and *Paspalum virgatum* were obtained from South Africa. Both grasses gave satisfactory results and are to be extended. The *Paspalum virgatum* is a shorter and finer variety than the *Paspalum virgatum* (Razor Grass) indigenous to this Colony. Beds of *Phaseolus semi-erectus*, *Alysicarpus caginis* (horse weed), and *Asystasia gangetica* (Demerara Primrose) were laid down for the purpose of seed collection and distribution.

Revenue.

18. Sale of stock, eggs, stud, and inspection fees, etc., gave a revenue of \$2,001.60.

March 15, 1935.

T. BONE,
 Government Veterinary Surgeon.

